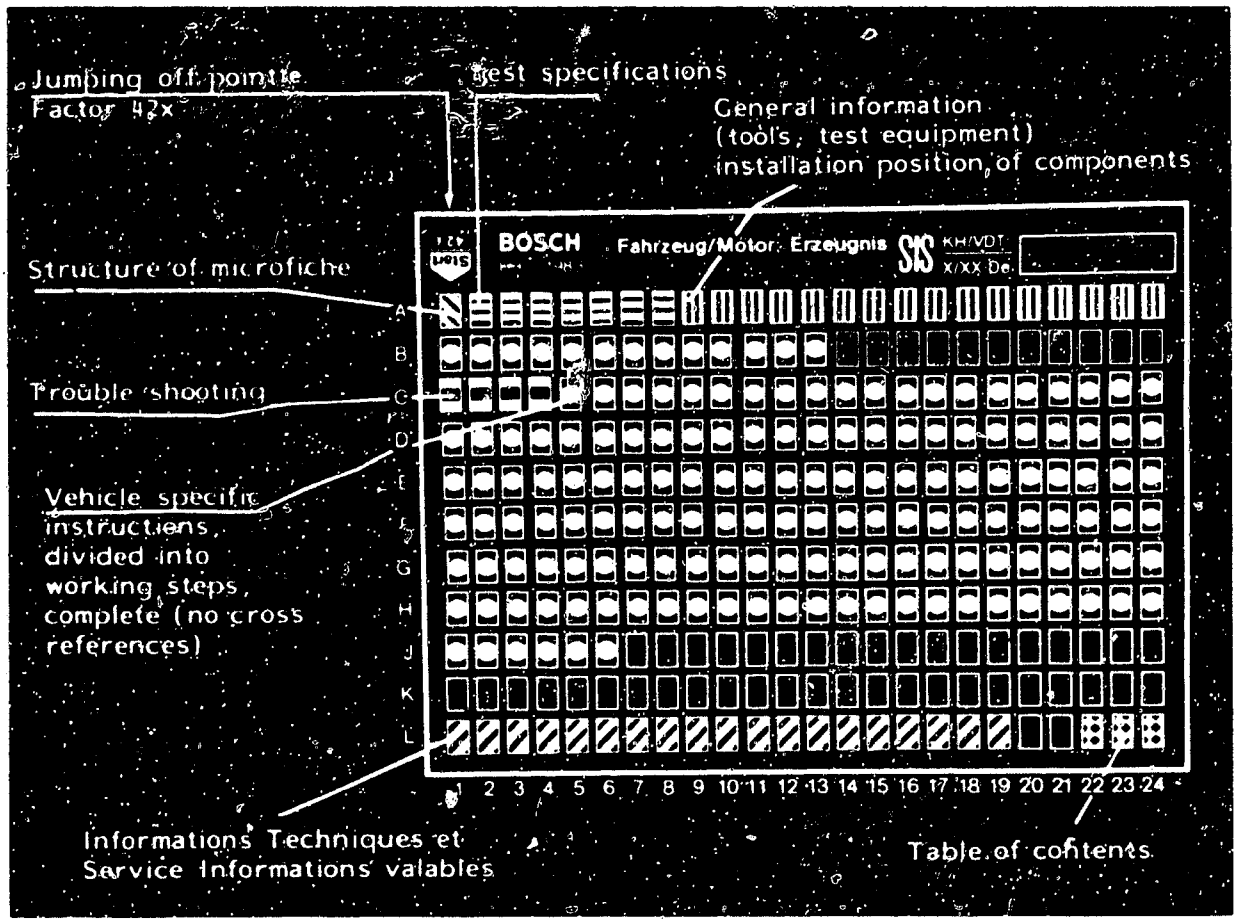
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar. |

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

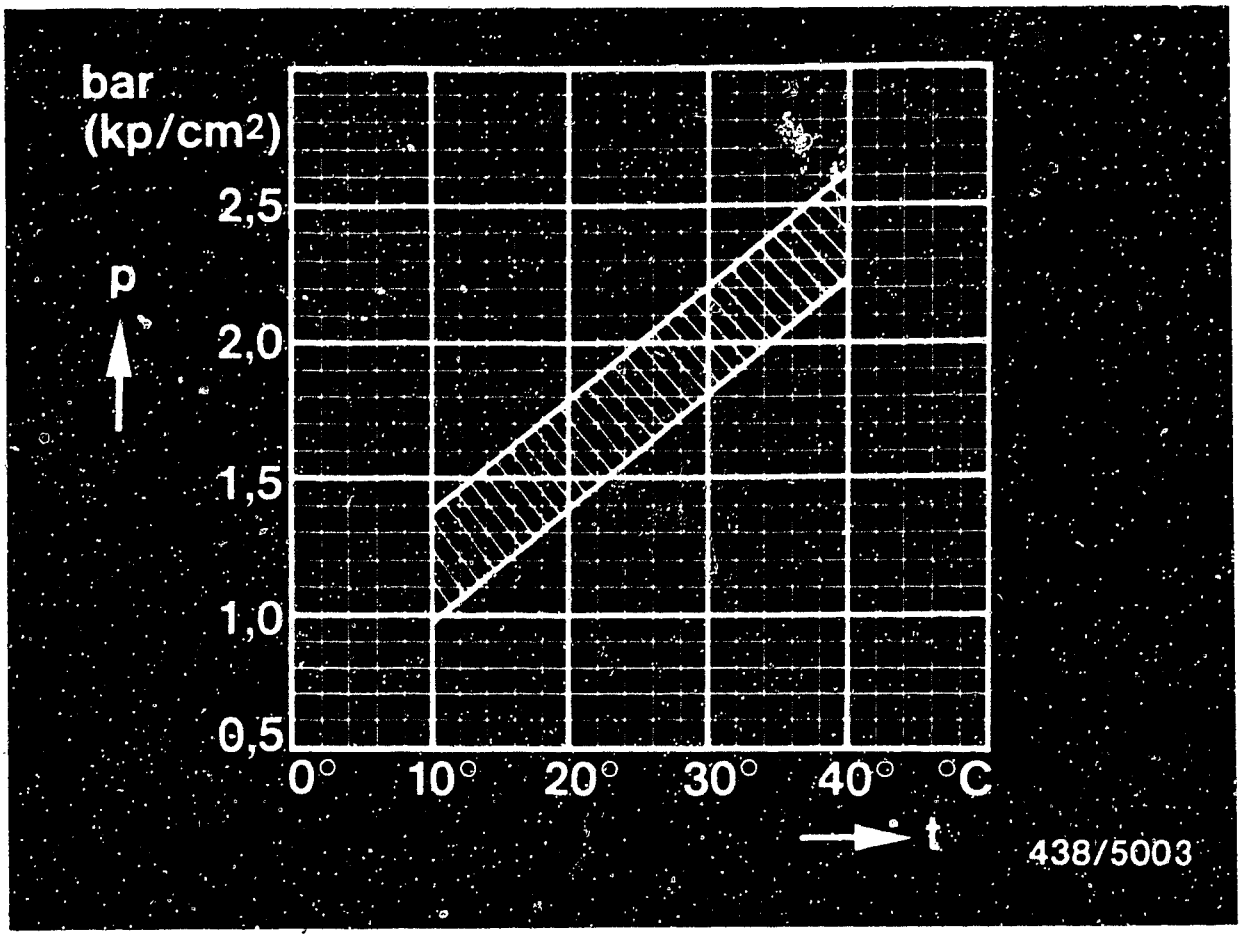
C6

1. Test specifications

1.1 Electric fuel pump

Test step	Test specifications
Fuel delivery:	
1978 model with 2 electric fuel pumps:	min.1360 cm^3/30 s
Models as of 1979 with 1 electric fuel pump:	min.1120 cm^3/30 s

D 10



p = Control pressure
t = Ambient temperature

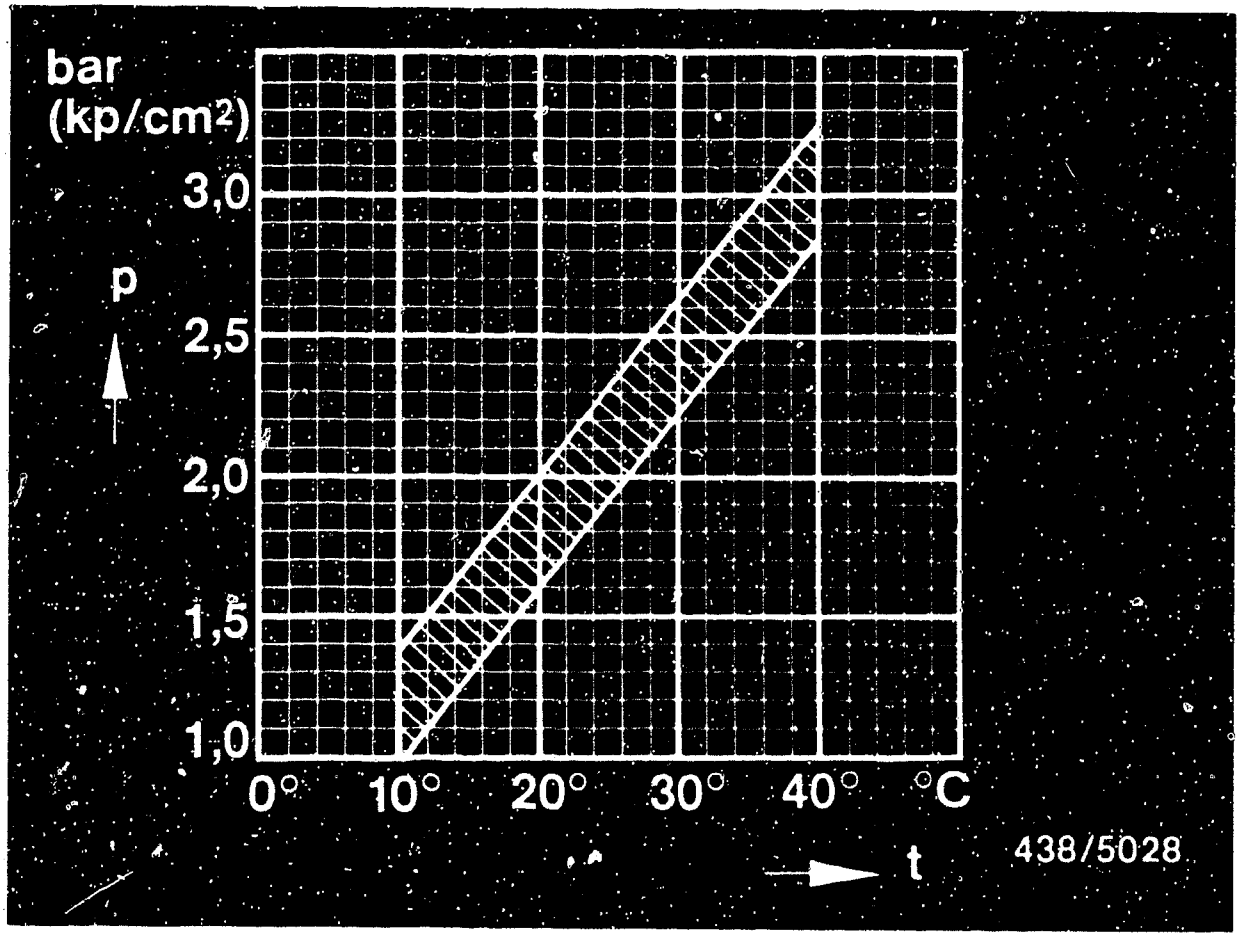
E1

Control pressure "cold"

(Warm-up regulator part no.: 0 438 140 036
086)

For testing, connect vacuum pump to intake-manifold pressure connection of warm-up regulator.

Setting value: 450...550 mbar
(340...420 mmHg)



p = Control pressure
t = Ambient temperature

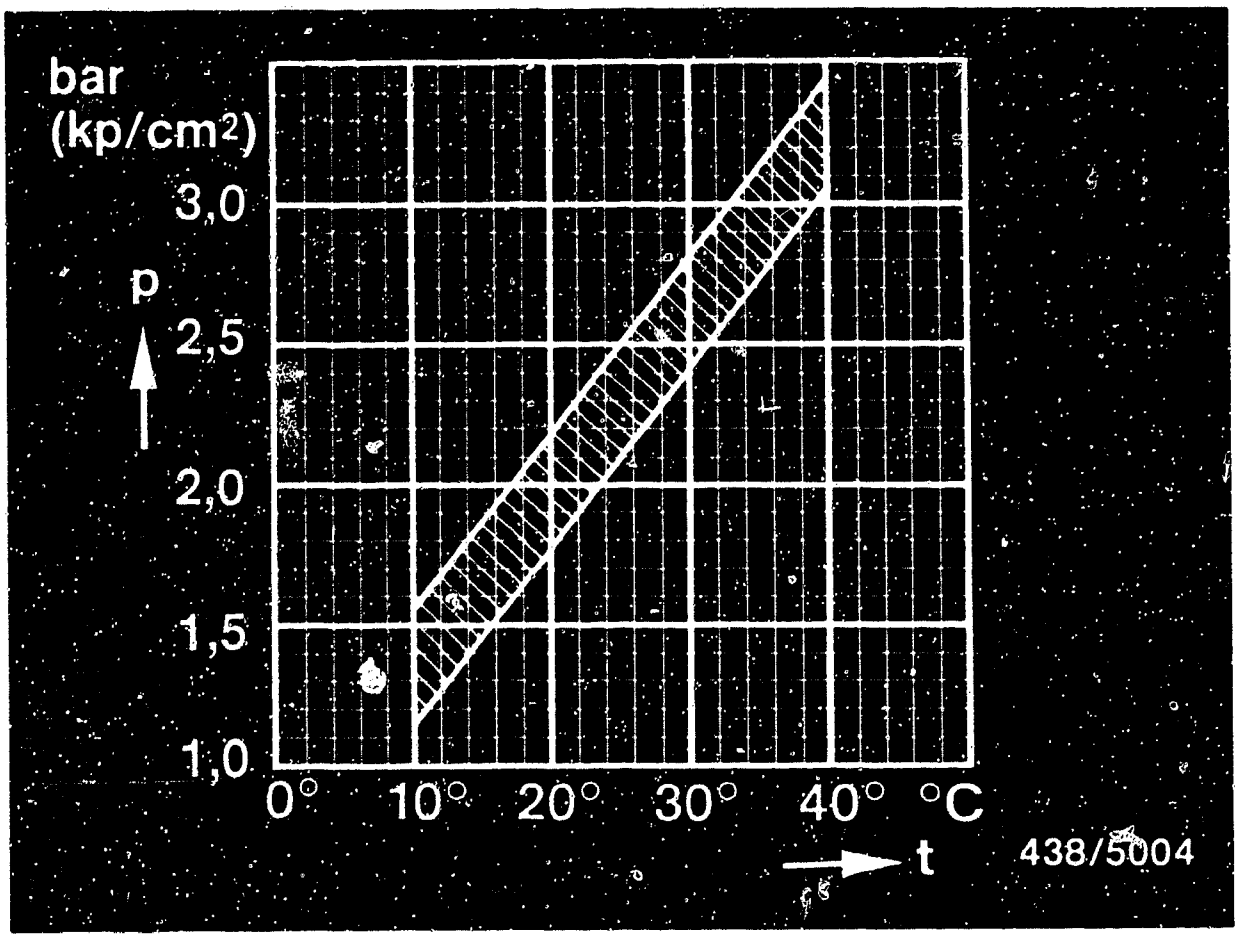
E1

1.2 Control pressure "cold"

(Part No. of warm-up regulator: 0 438 140 053
087

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 450...550 mbar
(340...420 mmHg



p = Control pressure
t = Ambient temperature

E1

1.2 Control pressure "cold"

(Part No. of warm-up regulator: 0 438 140 063

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 450...550 mbar
(340...420 mmHg)

Test step	Test specifications*

1.2 Control pressure "warm" — E1

Warm-up regulator part no. 0 438 140 036
053
063
086
087

(Version for manifold-pressure-controlled full-load enrichment)

- Test with atmospheric pressure (without vacuum): 2.8...3.2 bar (2.9...3.3 kgf/cm²)
- For testing, connect vacuum pump to intake-manifold connection of warm-up regulator.

  Setting values:
  450...550 mbar
  (340...420 mmHg): 3.4...3.8 bar (3.5...3.9 kgf/cm²)
- Leak test on full-load diaphragm
  Test pressure: 600 mbar (450 mmHg)
  max. pressure drop: 66 mbar (50 mmHg)/15 s

1.3 Primary pressure — F1

Checking value: 5.1...5.8 bar (5.2...5.9 kgf/cm²)

Setting value: 5.3...5.5 bar (5.4...5.6 kgf/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure)

Test step	Test specifications

F11

1.4 Leak test:

All models worldwide:
(fuel accumulator
0 438 170 026)

Minimum pressure after 10 minutes:	2.7 bar (2.8 kgf/cm²)
Minimum pressure after 20 minutes:	2.6 bar (2.7 kgf/cm²)

78/79 model USA:
(fuel accumulator
0 438 170 022; ... 025)

Minimum pressure after 10 minutes:	2.0 bar (2.1 kgf/cm²)
Minimum pressure after 20 minutes:	1.7 bar (1.8 kgf/cm²)

G15

1.5 Injection valves

Opening pressure:	3.0...4.1 bar (3.1...4.2 kgf/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

Test step	Test specifications

1.6 Fuel distributor

H1

Comparative measurement of fuel deliveries.

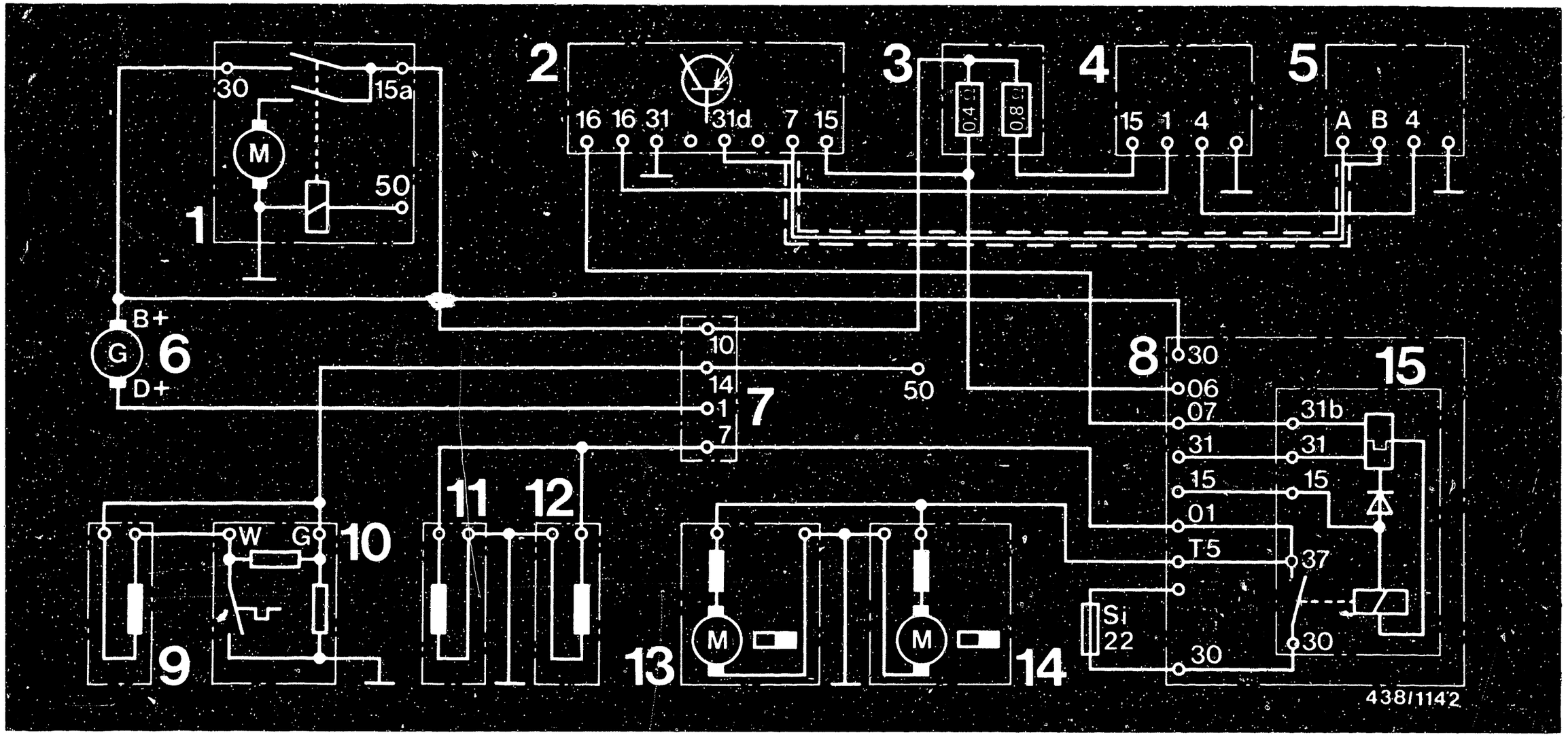
- Fuel distributor part no. 0 438 100 027

	Setting point	Max. allowable delivery
Idle	6.0 cm^3/min.	7.0 cm^3/min.
Part load	40.0 cm^3/min.	44.0 cm^3/min.
Full load	145.0 cm^3/min.	160.0 cm^3/min.

1.7 Idle adjustment

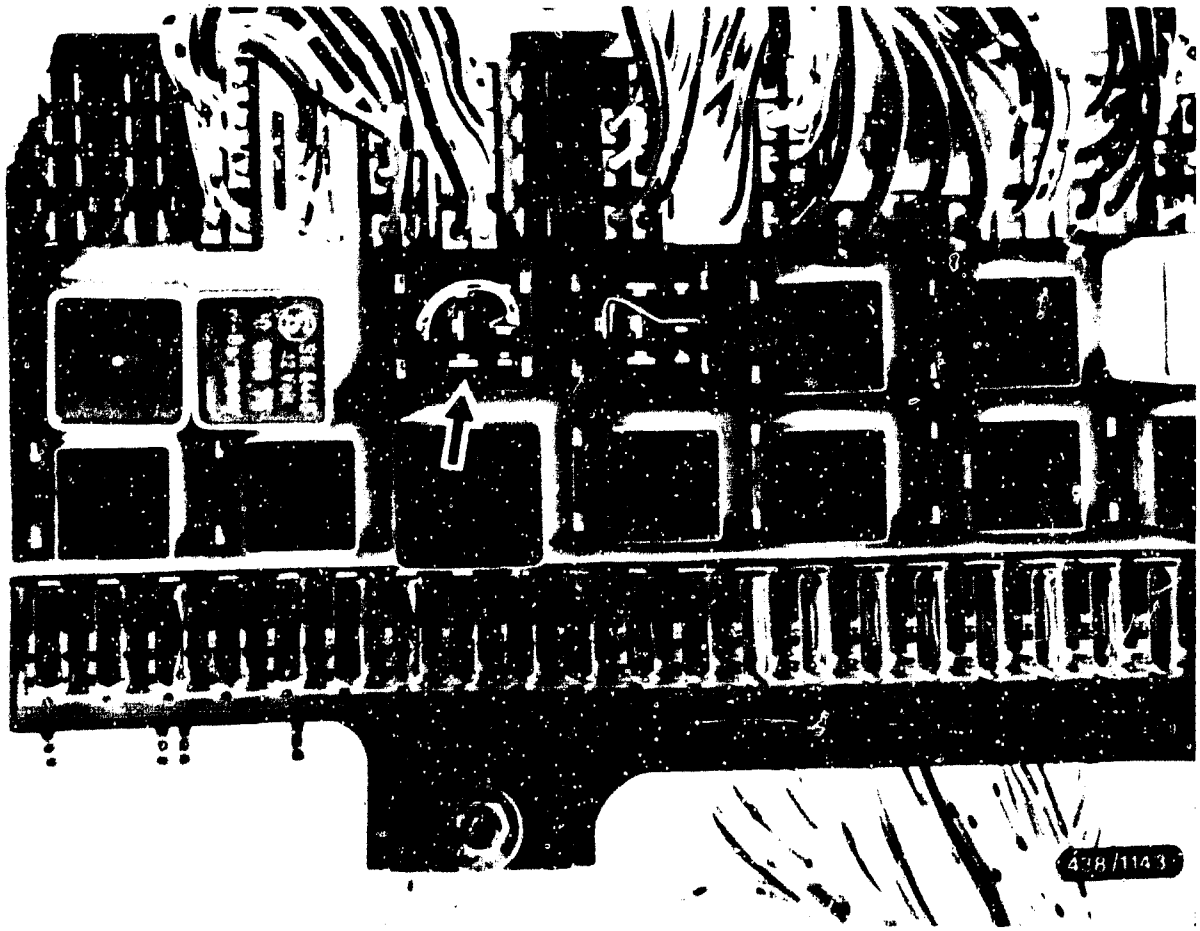
H21

Idle speed:	
Model:	
Europe 1978/1979:	700...750 min^{-1}
Europe 1980:	700...800 min^{-1}
USA/Japan 1978/1979:	750...850 min^{-1}
CO concentration:	
Model:	
Europe 1978/1979:	2.0...3.0 %
Europe 1980:	1.0...2.0 %
USA/Japan 1978/1979	2.0...4.0 %
	Secondary-air injection disconnected and line to engine sealed off tight.



2. Electrical safety circuit

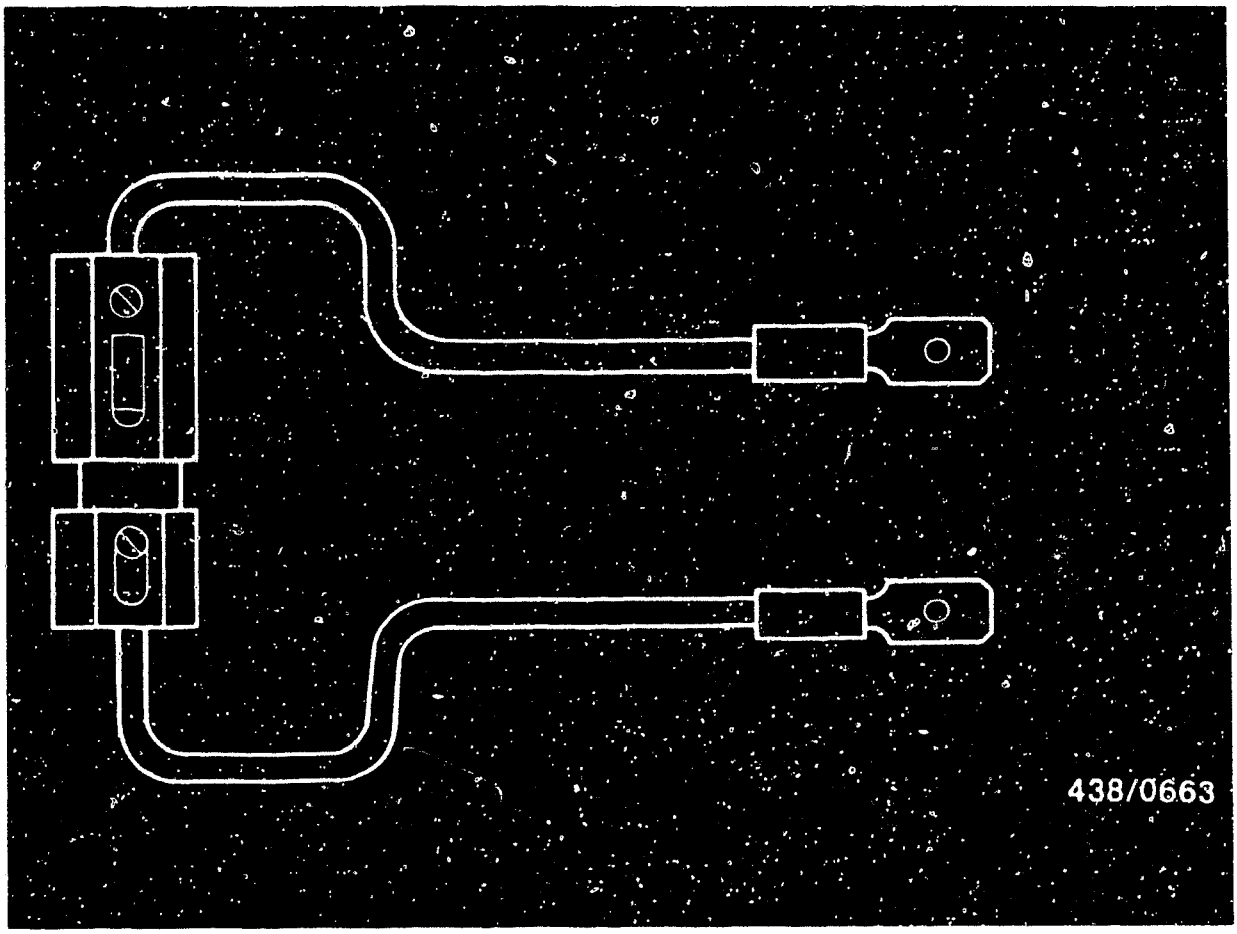
1 = Starting motor
2 = TCI trigger box
3 = Ballast resistors for ignition transformer
4 = Ignition transformer
5 = Ignition distributor
6 = Generator
7 = 14-pin connector in engine compartment
8 = Central-electrics console
9 = Start valve
10 = Thermo-time switch
11 = Warm-up regulator
12 = Auxiliary-air device
13 = Electric fuel pump 1
14 = Electric fuel pump 2 (1978 model only)
15 = Fuel pump relay No. XVII



The fuel pump relay XVII is in the central electrics console.

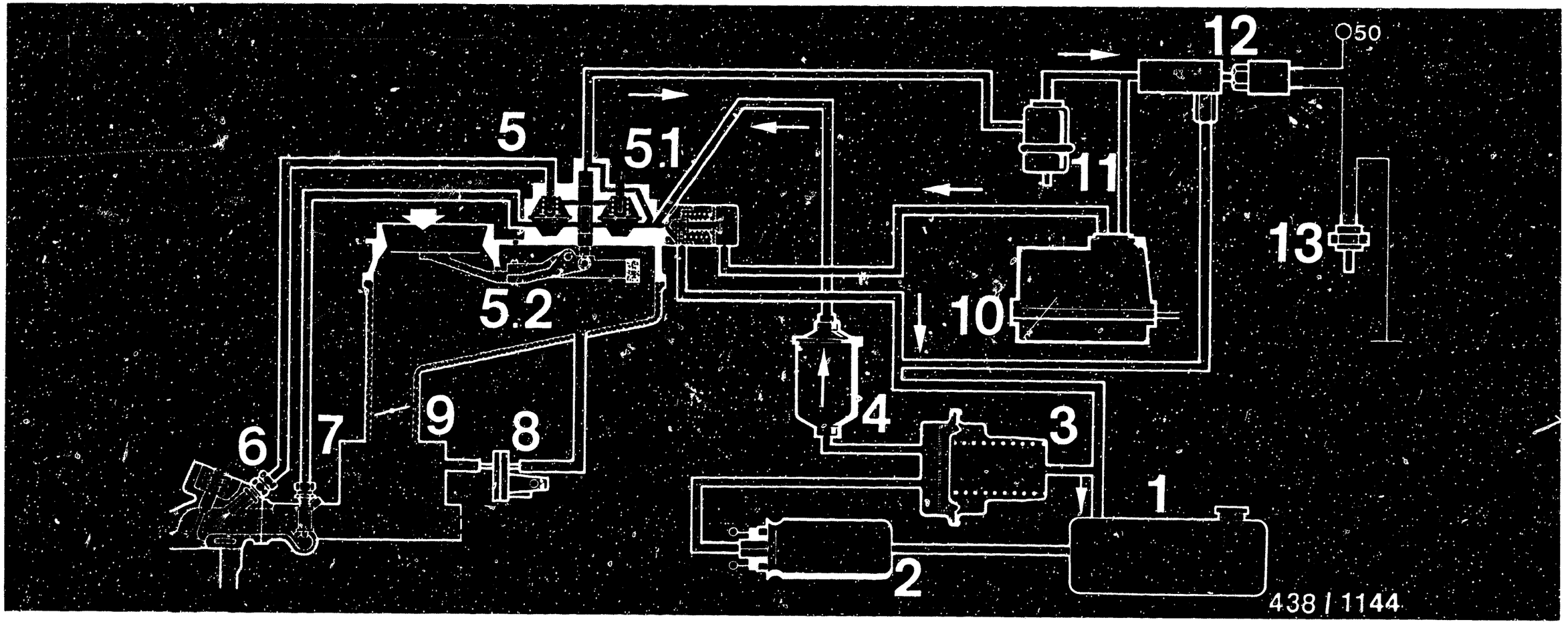
This is located in the front-passenger footwell and is accessible after removing the slanting cover.

To bridge the safety circuit, remove relay No. XVII and bridge terminals 30 and 87 (arrow).



Fit the jumper lead with a fuse holder and 16 A fuse.

Bridging the contacts means that the electric fuel pump, warm-up regulator and auxiliary-air device are supplied with battery voltage.



3. Diagram of fuel lines

1 = Fuel tank: USA/Japan 1979 model with built-in pre-supply pump
2 = Electric fuel pump: 1978 model was equipped with 2 electric fuel pumps
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Fuel distributor
5.2 = Air-flow sensor
6 = Injection valve(s)
7 = Start valve
8 = Auxiliary-air device
9 = Throttle-valve assembly with throttle valve
10 = Warm-up regulator
11 = Pressure damper: as of 1981 model and, if fuel distributor with capsule valve installed, also installed in earlier vehicles
12 = Pressure-reduction valve: as of 18.2.1981 date of production, in some cases also retrofitted in earlier vehicles to counter hot-starting problems
13 = Thermo-switch (switching point 35°C) for energizing the pressure-reduction valve (Item 12)

4. General information

4.1 Introduction:

This repair instruction manual refers to the Porsche vehicle models 928 and 928 S with K-Jetronic as of 78 model worldwide, as of 80 model excluding USA/Japan version. There is a concise description of the testing and adjusting operations which are to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications.

In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair instruction manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates C 1 - C 4 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

Ensure utmost cleanliness when working on the K-Jetronic. Thoroughly clean fuel connections on the outside before loosening.

4.2 Design of K-Jetronic:

The entire system of the K-Jetronic in the Porsche 928 and 928 S corresponds to the basic design as described in Technical Instruction VDT-U 3/1.

Note:
The USA/Japan models as of 1980 are equipped with L-Jetronic and are therefore not dealt with in this manual.

In the course of the previous years of production of the Porsche 928 various modifications and additions have been made to the K-Jetronic.

In some cases, these measures also served the purpose of operational improvement and may, therefore, also be installed in earlier vehicles.
They are described on the following coordinates.

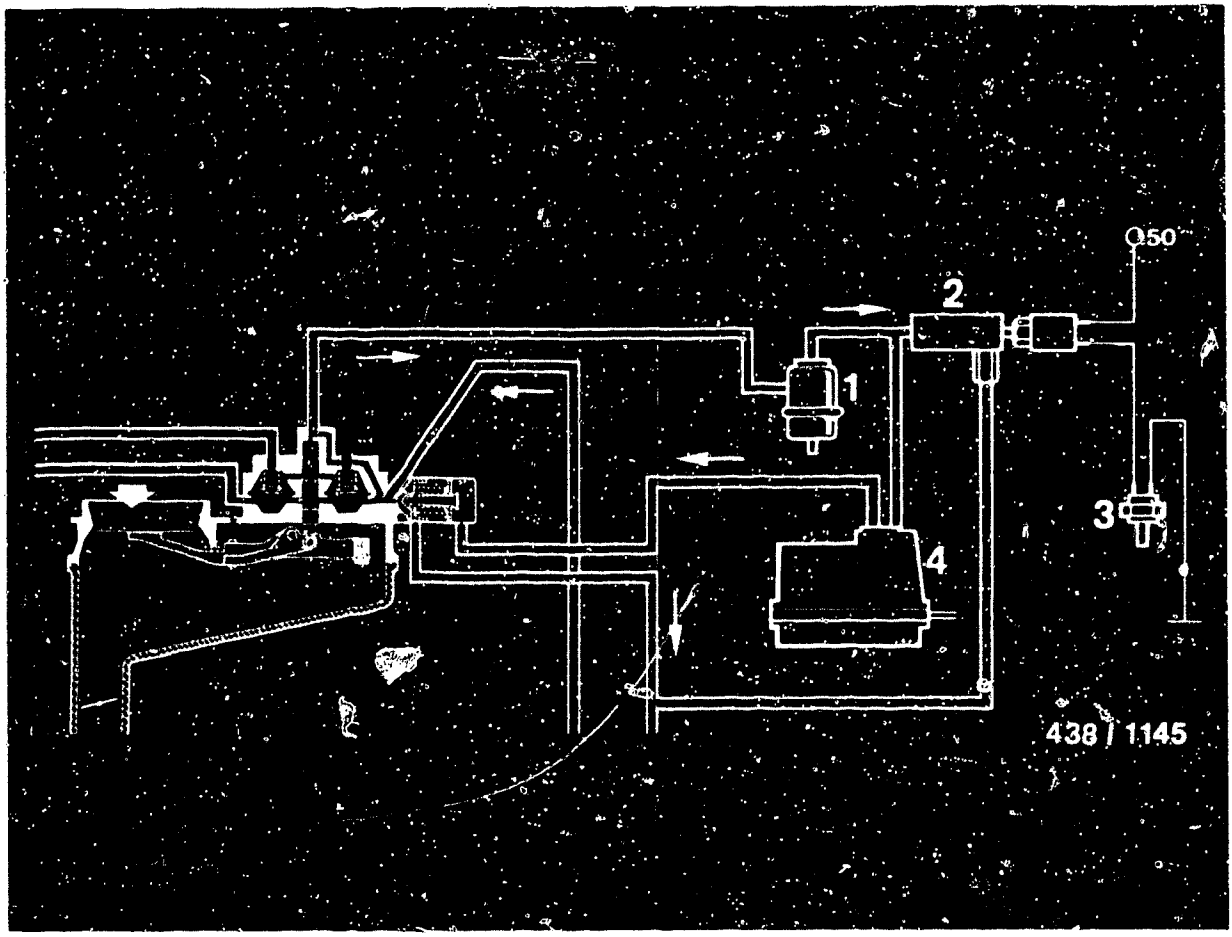
Electric fuel pumps:

In the first year of production (1978) the Porsche 928 was equipped with 2 electric fuel pumps which were hydraulically connected in series.

As of the 1979 model only one electric fuel pump is installed. As of the 1979 model the USA/Japan models were provided instead with a pre-supply pump (not made by Bosch) which is installed in the fuel tank.

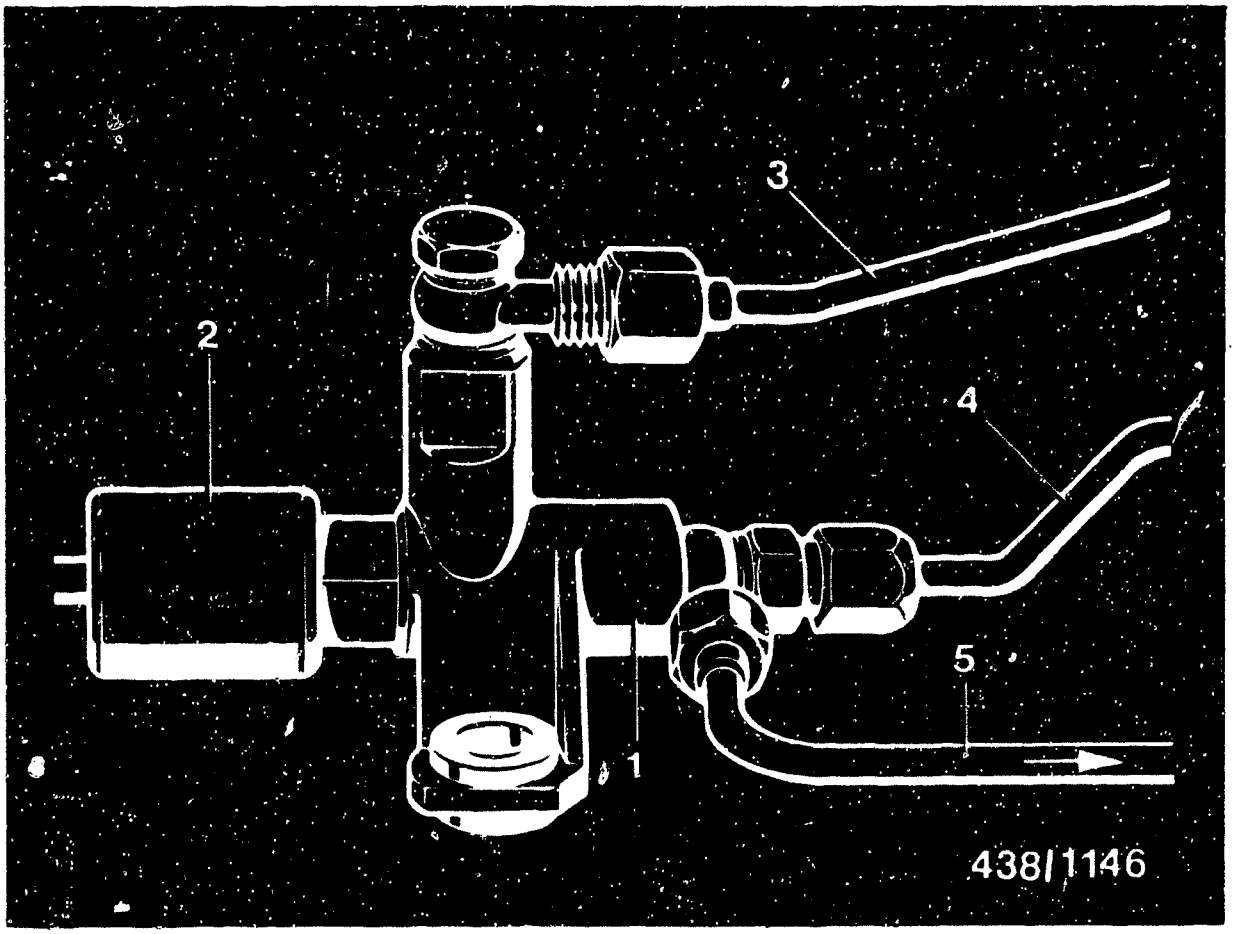
Additional device for control-pressure reduction for hot starting:

To improve the hot-starting performance, the Porsche 928 and 928 S have been equipped since 18.2.1981 with an additional device for reducing the control pressure during hot starting.



1 = Fuel-line-pressure damper (see Section 2)
2 = Control-pressure-reduction valve
3 = Thermo-switch
4 = Warm-up regulator

The additional device is not a Bosch product and consists of an electromagnetically actuated needle valve with mounting piece and corresponding connecting lines. The valve is mounted on the intake-port flange of cylinder 3 and is connected hydraulically in parallel with the warm-up regulator. Electrically, the valve is energized by terminal 50 and a thermo-switch.
Operation: During hot starting the control pressure of the K-Jetronic is near the shutoff point of approx. 3.6 bar gauge pressure due to the contact heat of the warm-up regulator.



1 = Control-pressure-reduction valve
2 = Electromagnet
3 = Fuel line to collective return line
4 = Fuel line from fuel distributor
5 = Fuel line to warm-up regulator

Since, after the engine has been switched off while hot, it is possible for vapour bubbles to form in the injection lines, it is of advantage to reduce the control pressure for hot starting. The consequently increased fuel delivery accelerates the purging of the injection lines and thus enhances the willingness of the engine to start. This control-pressure reduction is performed by the above-mentioned control-pressure-reduction valve.

By means of the open valve there is a direct connection between the fuel distributor and the collective fuel return line in the control-pressure circuit. The operation of the warm-up regulator is thus interrupted, and the control pressure is reduced to a value of approx. 0.6 bar gauge pressure.

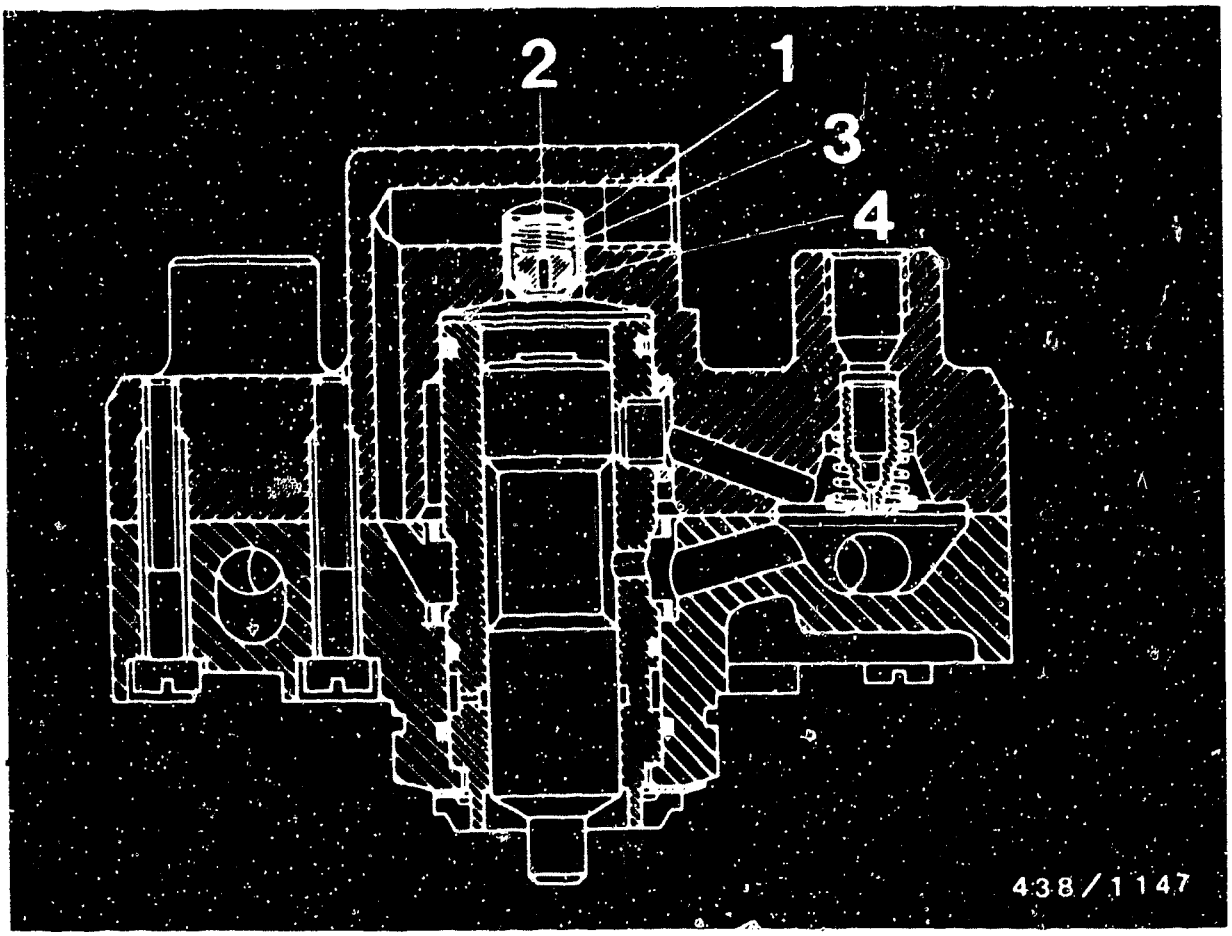
In accordance with the switching point of the thermo-switch (negative (-) to solenoid-operated valve) the control-pressure reduction is only operative at temperatures above 35°C and only while the starting motor is being operated since this connects the positive (+) feed via terminal 50.

Important:

The influence of a possibly defective control-pressure reduction system should be borne in mind when performing trouble-shooting in the vehicle (control-pressure test, leak test on entire system).

Note:

This additional device has also been installed in earlier vehicles by Porsche workshops to improve hot starting.



1 = Capsule valve
2 = Restriction bore
3 = Valve spring
4 = Valve piston with seal ring

Fuel distributor with capsule valve and additional pressure damper:

As of the 1981 model year the Porsche models 928 and 928 S are equipped with a fuel distributor with capsule valve (instead of non-adjustable flow control valve).

Operation:

The capsule valve contains a spring-loaded valve piston with restriction bore. The restriction bore has the same task as the previous non-adjustable flow control valve, namely to damp the oscillations of the air-flow sensor plate as the air flow pulsates.
The enrichment of the air-fuel mixture necessary for acceleration is determined by a specific overshooting of the air-flow sensor plate and the consequent rise of the control plunger. The extent of overshooting is determined by the size of the restriction above the control plunger. In the case of rapid acceleration the valve piston in the capsule valve is raised, thus providing quicker displacement of the fuel above the control plunger. This results in optimization of the transient response of the engine. In the case of slow acceleration and in all other operating conditions of the engine, the valve piston remains closed.

This modification to the fuel distributor was performed without changing the part number, but the respective version can be identified by the colour of the nameplate.

Fuel distributor part number: 0 438 100 027

Colour of nameplate:

Fuel distributor with non-adjustable flow control valve, earlier version	red
Fuel distributor with capsule valve, as of 1981 model:	black/red

The introduction of the fuel distributor with capsule valve also requires the installation of a fuel-line-pressure damper in the control-pressure line from the fuel distributor to the warm-up regulator.

In a service bulletin Porsche has informed its own service organization of the above-mentioned modifications and additions and has ordered that after stocks have been used up only the 1981 model fuel distributor (with capsule valve) is to be installed also in earlier vehicles (model years 1978 to 1980), should it be necessary to replace the fuel distributor.

We endorse this procedure for the Bosch After-Sales Service Organization.

When converting, however, it is absolutely essential also to install the fuel-line-pressure damper.

The installation of the fuel-line-pressure damper is described in detail in this manual in each test step which might involve replacing the fuel distributor. It should be noted that this requires various mounting parts which are to be obtained through your Porsche agent.

New versions of warm-up regulator:
To improve the warm-up behaviour of the 928/928 S models, warm-up regulators with a modified characteristic have been installed since 1981 model year:

Warm-up regulator part numbers:

928:	0 438 140 087
928 S:	0 438 140 086

These warm-up regulators are equipped with two separate heating resistors whereby one heating resistor is energized by a thermo-contact.

Operation:

At temperatures below 15°C the thermo-contact is open. After the engine has started in this temperature range, therefore, initially only one heating resistor is switched on, as a result of which the shutoff process is delayed.

When the temperature exceeds 15°C, either as a result of higher ambient temperature or due to the heating resistor which is already switched on, the thermo-contact closes and connects in the second heating resistor. Both heating resistors are connected in parallel. Due to the thus increased heating effect, therefore, the shutoff function of the warm-up regulator is accelerated at temperatures above 15°C.

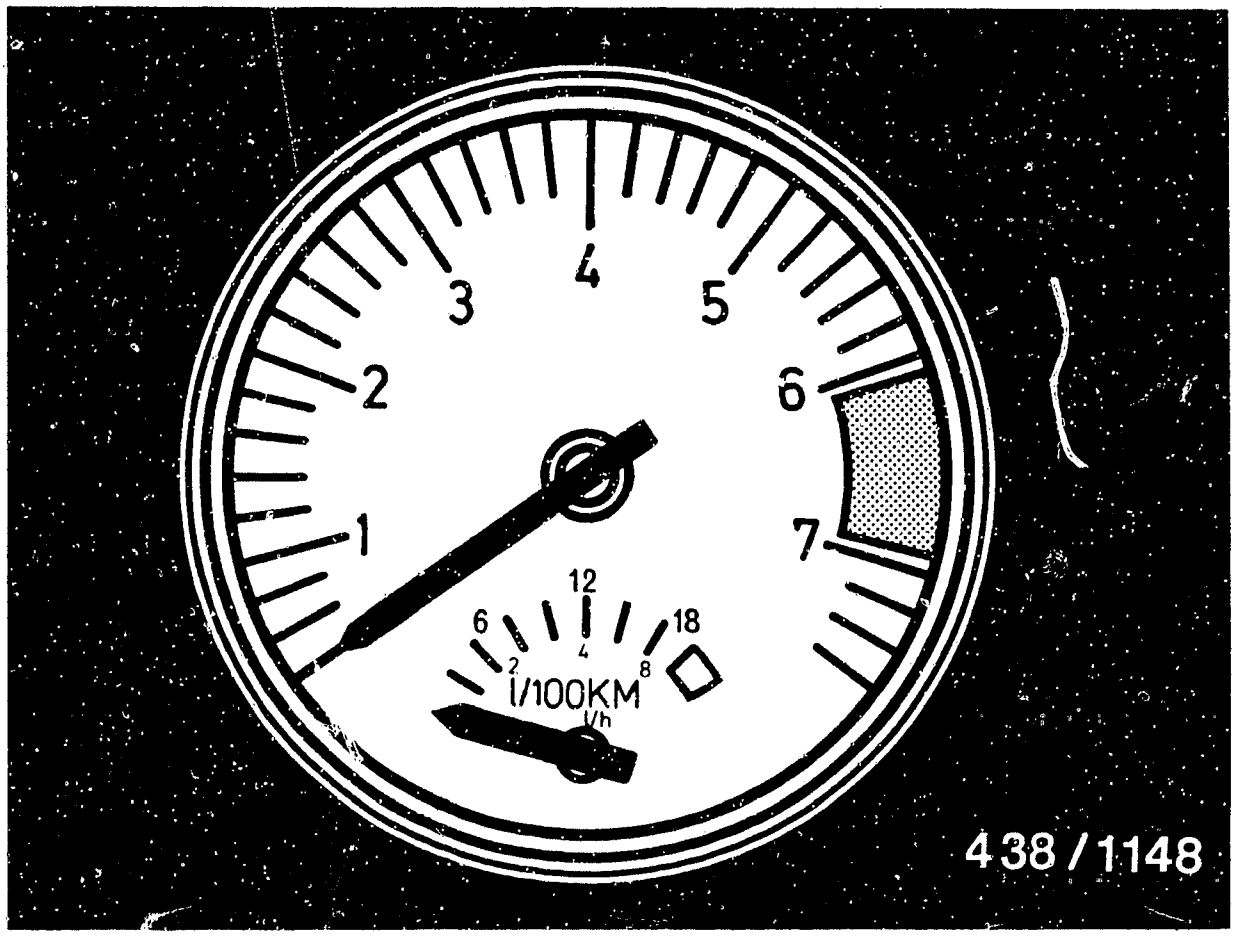
Porsche has recommended its own service organization in future to install only the above-mentioned 1981 model year warm-up regulator even in earlier vehicles (1978... 1980 model), should there be a complaint.

We endorse this recommendation for the Bosch After-Sales Service Organization.

In this connection, be sure to observe the following:

In the case of warm-up regulators with thermo-contact, the correct polarity of the electrical connector must be ensured. In the case of incorrect connection, the thermo-contact will be destroyed.

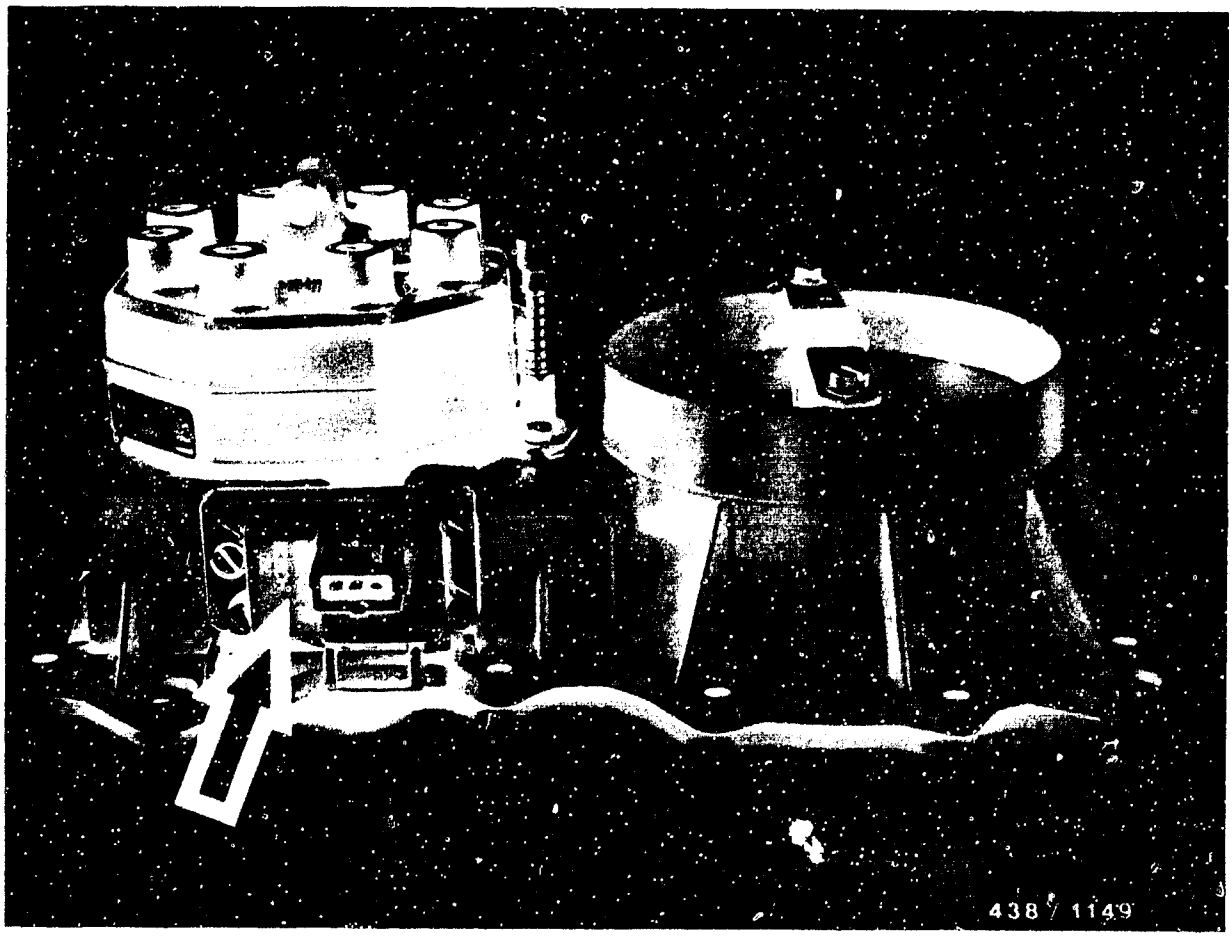
In the 928/928 S vehicles of model years 1978 to 1980 the correct polarity is not specified. Therefore, when installing the new warm-up regulators, this must be tested and, if necessary, rectified on the connector (+ to +, - to -).



Air-flow sensor with sensor for fuel consumption indicator

All Porsche 928 and 928 S vehicles as of the 1982 model are equipped with a fuel consumption indicator.

The instrument is integrated in the tachometer. The consumption is indicated in l/100 km or at speeds below 33 1/3 km/h in l/h. In export vehicles the indication may also be in miles/gallon (MPG) or in gallons/hour (G/h), depending on the export country.



In K-Jetronic vehicles the consumption is indicated as a function of the position of the air-flow sensor plate which is a direct measure of the instantaneous fuel throughput/consumption. The position of the sensor plate is scanned by an inductive angle sensor on the air-flow sensor whose short-circuit ring follows the rotary movement of the control lever bearing pin.

The signal from the angle sensor consists of a rectangular voltage whose frequency is between approx. 20 and 25 kHz depending on the angular position. The pulse duty factor of the rectangular voltage is between 30 and 70 % throughout the entire frequency range.

An electronic circuit in the instrument cluster evaluates the signal from the sensor as well as the likewise required signals on engine speed and road speed. The instrument cluster and the evaluation circuit are not Bosch products.

Notes on trouble-shooting in the event of failure of the consumption indicator:
Replacing the angle sensor on the air-flow sensor and readjusting is not possible using workshop equipment. Therefore, if the sensor fails, replace the complete air-flow sensor.

Repairing the air-flow sensor, such as replacing the control lever or the lever mounting, would likewise require readjustment of the angle sensor and is therefore not possible. Conversely, the air-flow sensor plate can be replaced as usual.

If the consumption indicator fails, it is possible as follows to check whether the cause lies with the angle sensor of the air-flow sensor.

Test connecting leads between angle sensor and instrument cluster for open circuit.

Test power supply to sensor:
Disconnect triple connector from sensor and, with ignition on, check whether there is approx. 8 V between terminals 1 and 2.

By connecting an oscilloscope to terminal 3 of the connected triple connector it is possible to see the sensor signal with the ignition on (rectangular signal). This signal must change when the sensor plate is moved. If there is no change or no signal, replace the complete air-flow sensor. This test can be simplified with an externally connected air-flow sensor. The consumption indicator must react to movements of the sensor plate. If sensor, leads and plug-in connections are O.K., the only possible cause is the instrument cluster.

5. Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034).
  For testing all fuel pressures and testing for leaks.
- Connecting-parts set KDJE-P 100/11 (previously KDEP 1034/11).
  For connecting pressure tester to the control-pressure port of the fuel distributor.
  Connecting-parts set KDJE-P 100/10 (previously KDEP 1034/10).
  For direct connection of start valve to fuel distributor for functional test.
- Guide ring KDEP 1040/14 (110 mm dia.)
  For centering the air-flow sensor plate in the air-flow sensor.
- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).
  For comparing the fuel delivered from the individual fuel-distributor outlets.
- Line set KDJE-P 200/25 (previously KDJE 7451/25)
  For connecting the tester for delivered quantity comparison to the K-Jetronic system with steel injection tubing.
- Graduate (commercially available, capacity approx. 1.5 l)
  For measuring the delivery of the electric fuel pump.
- Electric connecting cable (test lead).
  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.
- Vacuum pump (commercially available)
  For testing the warm-up regulators with full-load enrichment dependent on intake-manifold pressure, e.g. the vacuum hand-operated "Mityvac" pump from

Firma Korinth
Ludwig-Kloos-Strasse 21
6450 Hanau 7 (Steinheim)

- Tool set for fitting and removing idle anti-tamper device. (e. g. No. 4521/7 from Firma Hazet, 5630 Remscheid).

- Valve tester KDJE-P 400 (previously KDJE 7452).
  For testing the injection valves.

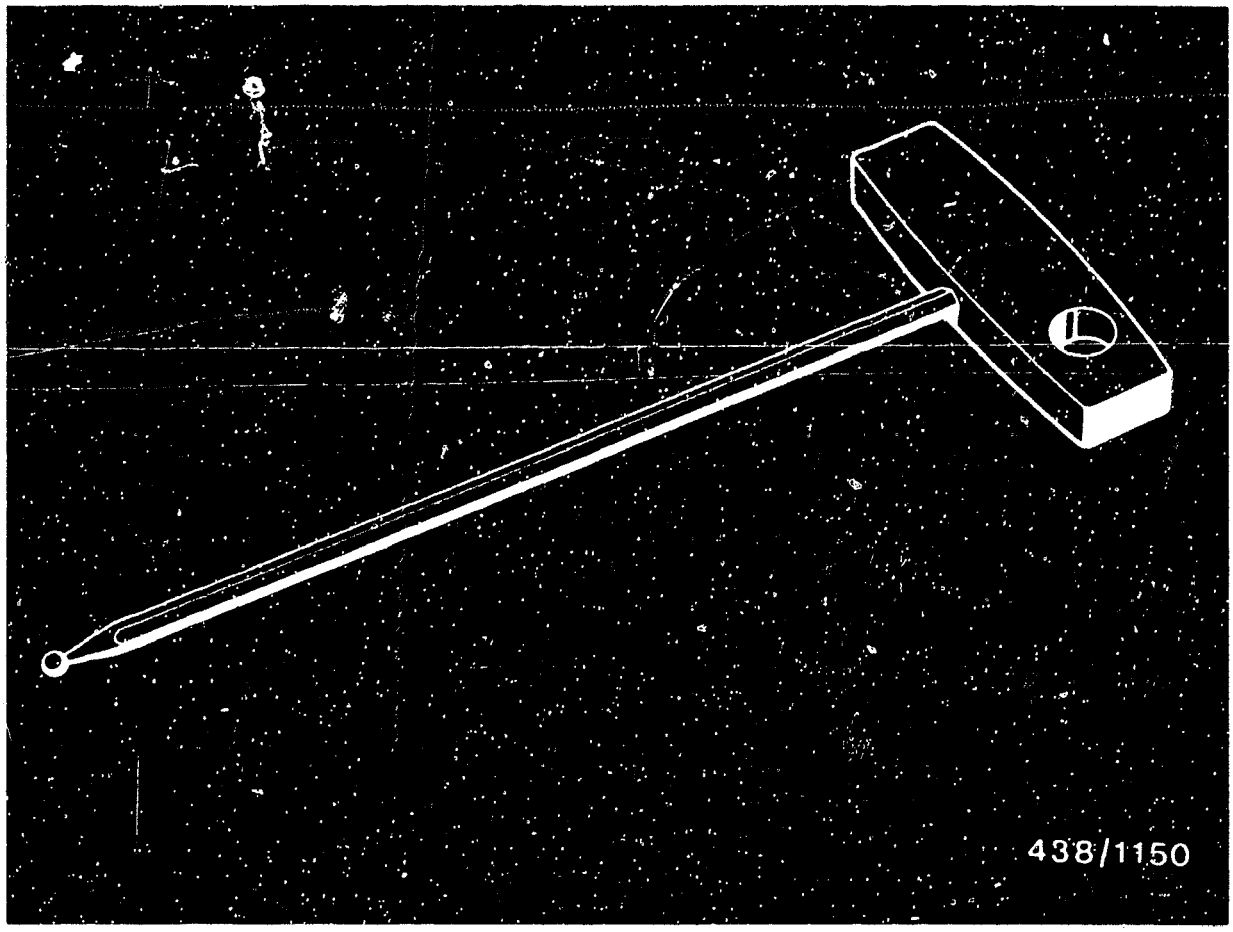
Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or
Bosch, Part No. VS 14 942-CH
(previously 5 973 340 650)
The calibrating fluid from Bosch can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.

- Tachometer (commercially available)
  For idle-speed adjustment.

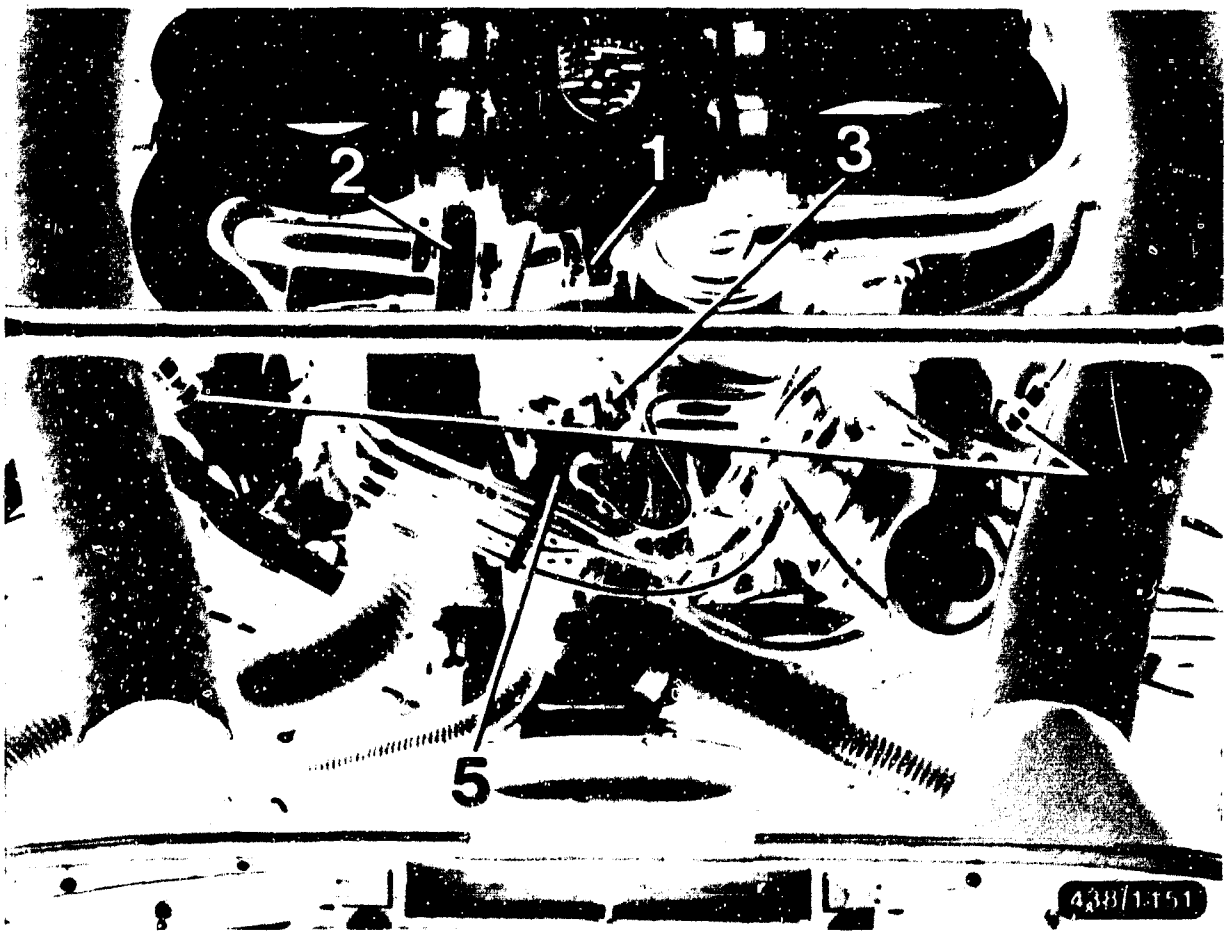
- CO meter (commercially available)
  For idle-speed CO adjustment.

- Setting device KDJE 7456
  For deflecting the air-flow sensor plate (downdraft air-flow sensor) when comparing the fuel deliveries from the fuel-distributor outlets.



To adjust the idle-mixture-adjusting screw (idle adjustment), it is necessary to use a commercially available hexagon screwdriver with ball head AF 3 (see picture).

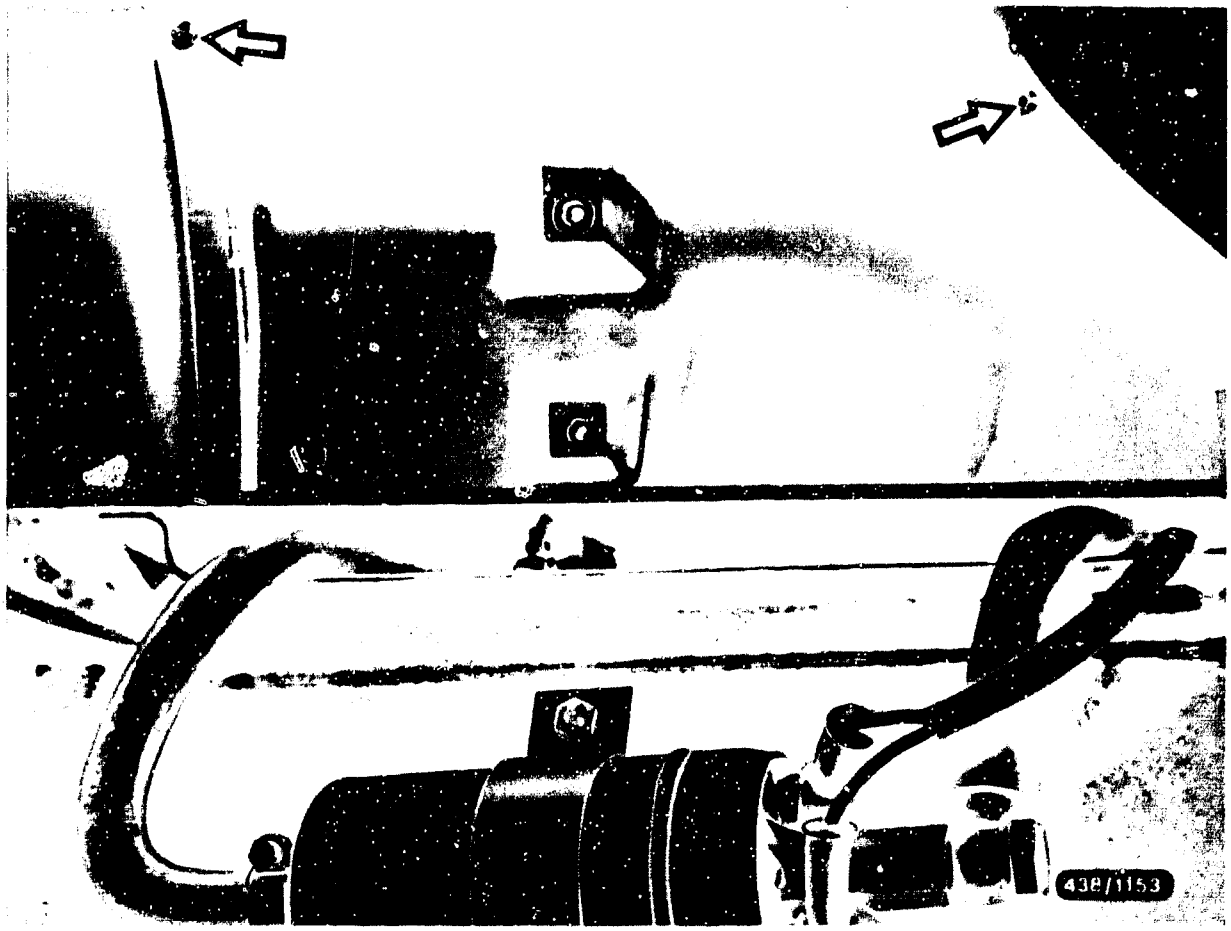
A similar wrench with screwdriver handle is contained in Jetronic case KDJE-K 100.



6. Installation position of individual components

1 = Start valve
2 = Auxiliary-air device
3 = Thermo-time switch
4 = Injection valves (others hidden)
5 = Warm-up regulator

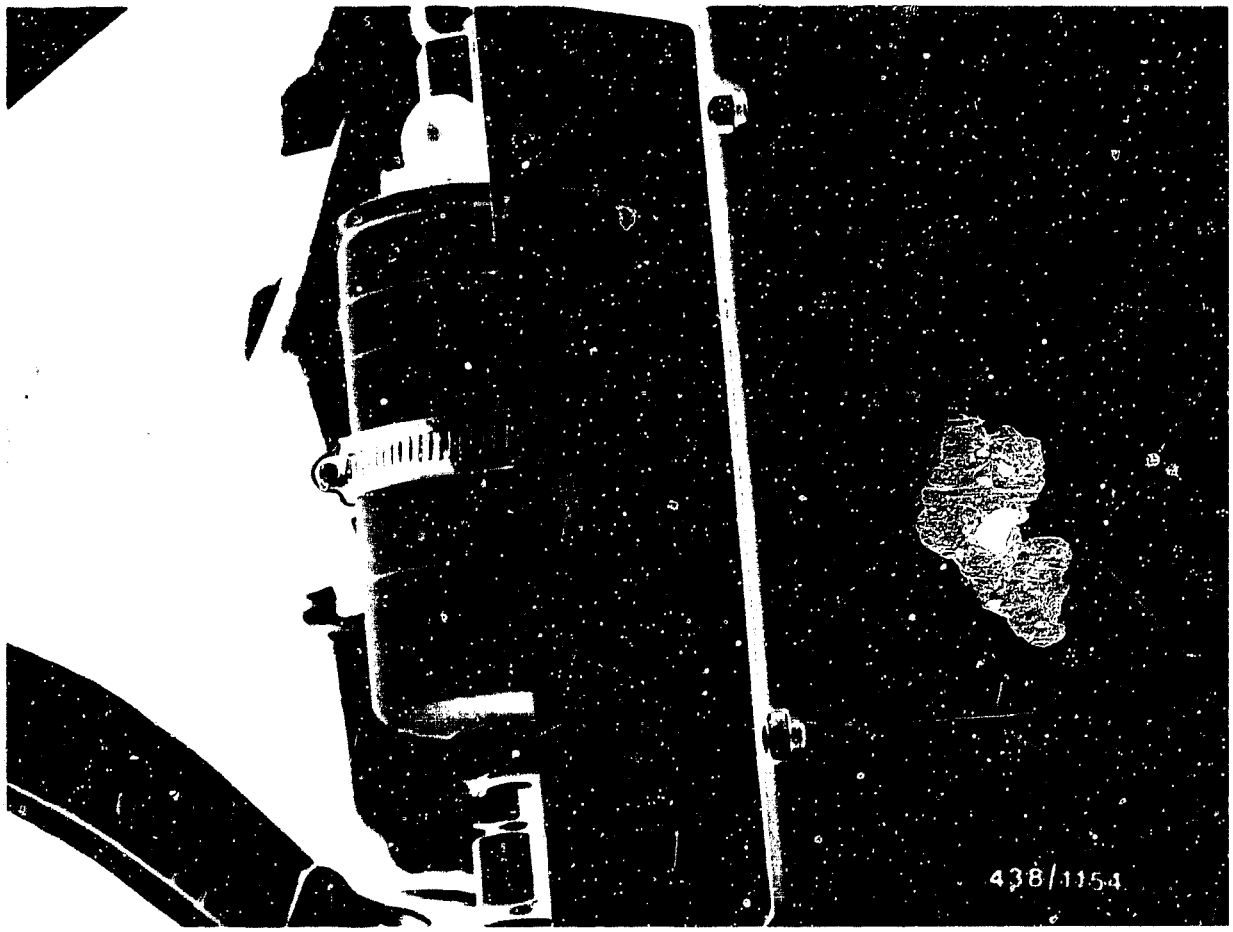
The mixture-control unit is accessible after removing the air filter.



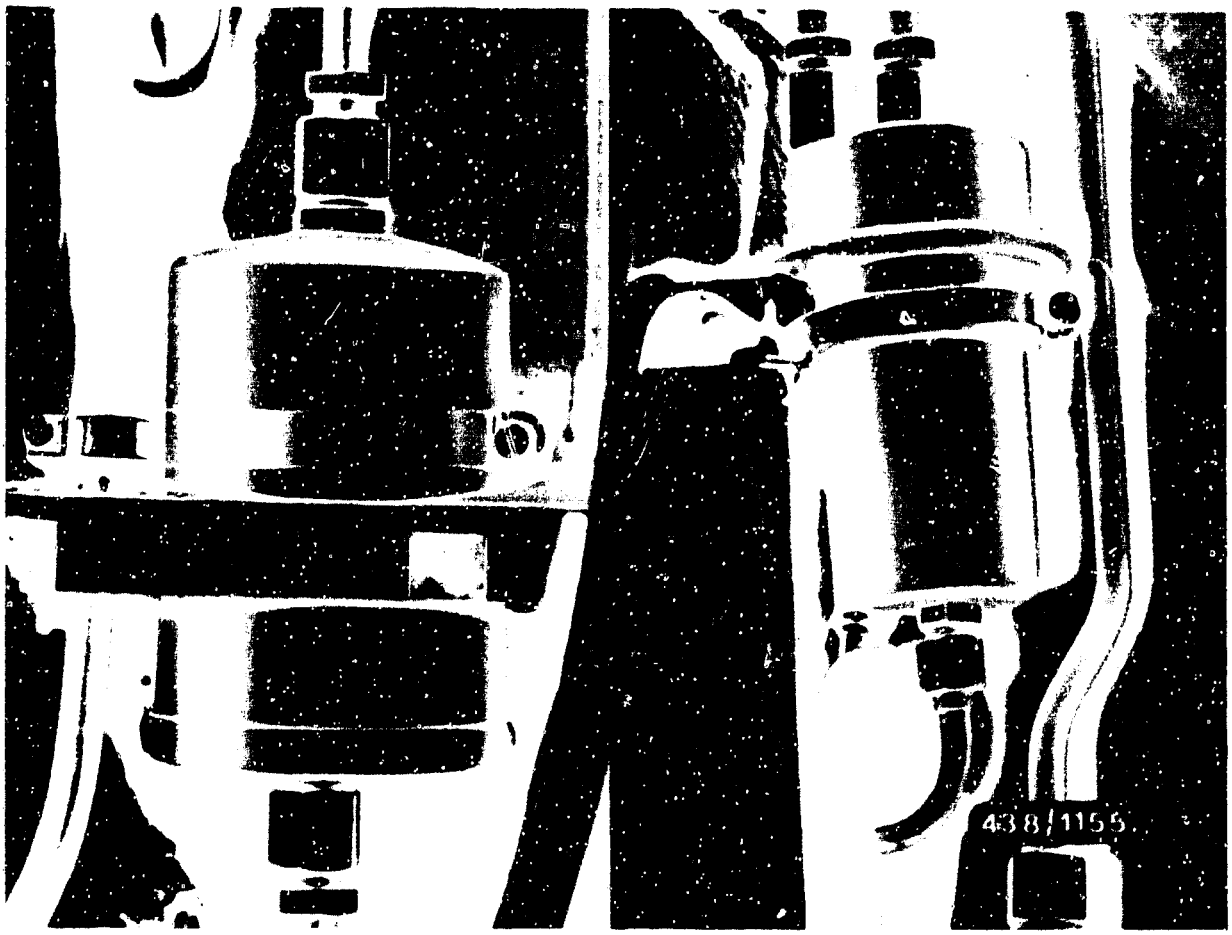
The electric fuel pump is mounted directly on the fuel tank on a mounting plate.

After loosening the upper fastening screws (arrows), it is possible to hinge down the mounting plate, thus making the pump accessible.

On the 1978 model (equipped with 2 electric fuel pumps) electric pump 1 is mounted in this position.



Electric fuel pump 2 on the 1978 model is under the right-hand rear fender near the fuel-tank filler neck.



The fuel accumulator and fuel filter are under the front dirt-deflector plate in the right-hand rear wheel box.

7. Trouble-shooting chart (see also Coordinates B 3/B 4)

*Note:
If, with fault symptom 2, the hot-start performance is unsatisfactory after testing and remedying all the causes given below, it is possible to install a time-pulse relay as an improvement measure.
This is described on Coordinate L 4.
(Concerns only 1978-1980 models, without additional device for control-pressure reduction)

**
Concerning fault symptom 5, see also modifications (fuel distributor, warm-up regulator) as of 1981 model.

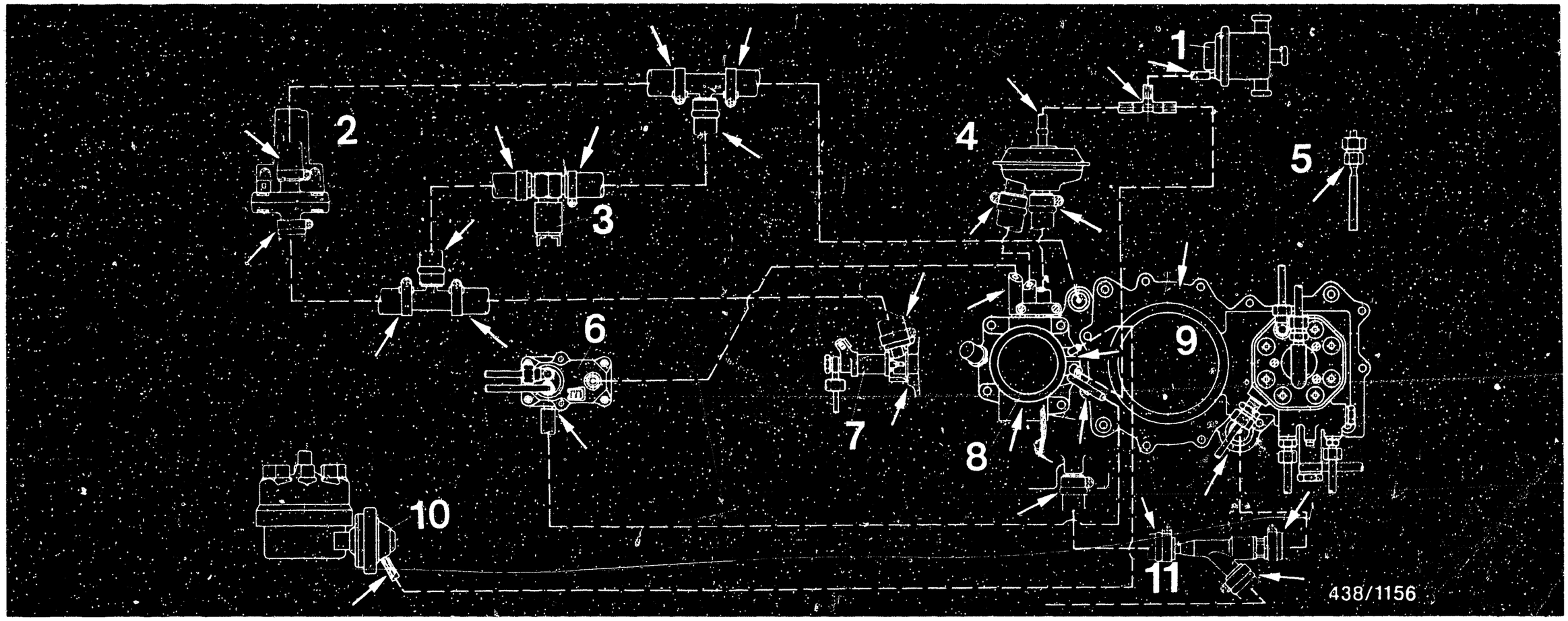
Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition
2. Engine does not start, or starts poorly, in warm condition (hot starting difficulties*)
3. Irregular idling during the warm-up phase (shakes)
4. Irregular idling with warm engine (shakes)
5. Engine does not draw gas (burbles) in the warm-up phase **
6. Engine misfires when operating on the road, high load
7. Insufficient power

1	2	3	4	5	6	7	Cause	Coordinates
	●	●	●	●		●	Vacuum system leaking	C 5
●	●		●	●	●	●	Air-flow sensor lever/control plunger not moving freely	C 9
	●						Position of air-flow sensor plate incorrect	D 3
●		●					Auxiliary-air device not opening	D 8
●	●				●		Electric fuel pump not operating	D10
●							Cold-start system defective	D20
		●	●				Start valve leaking	D20
				●			Excessive fuel delivery for control-pressure circuit	E 1
●		●		●			Control pressure "cold" outside tolerance	E 1
	●		●		●	●	Control pressure "warm" (after warm-up) too high	E 1
			●			●	Control pressure "warm" (after warm-up) too low	E 1
					●	●	Primary pressure outside tolerance	F 1
	●						Overall fuel system leaking	F11
●	●	●	●		●		Injection valves leaking, opening pressure too low	G15
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	H 1
●	●	●	●	●			Basic idle adjustment incorrect	H21
						●	Throttle valve not opening completely	-

Customer complaint (fault symptom) (continued)

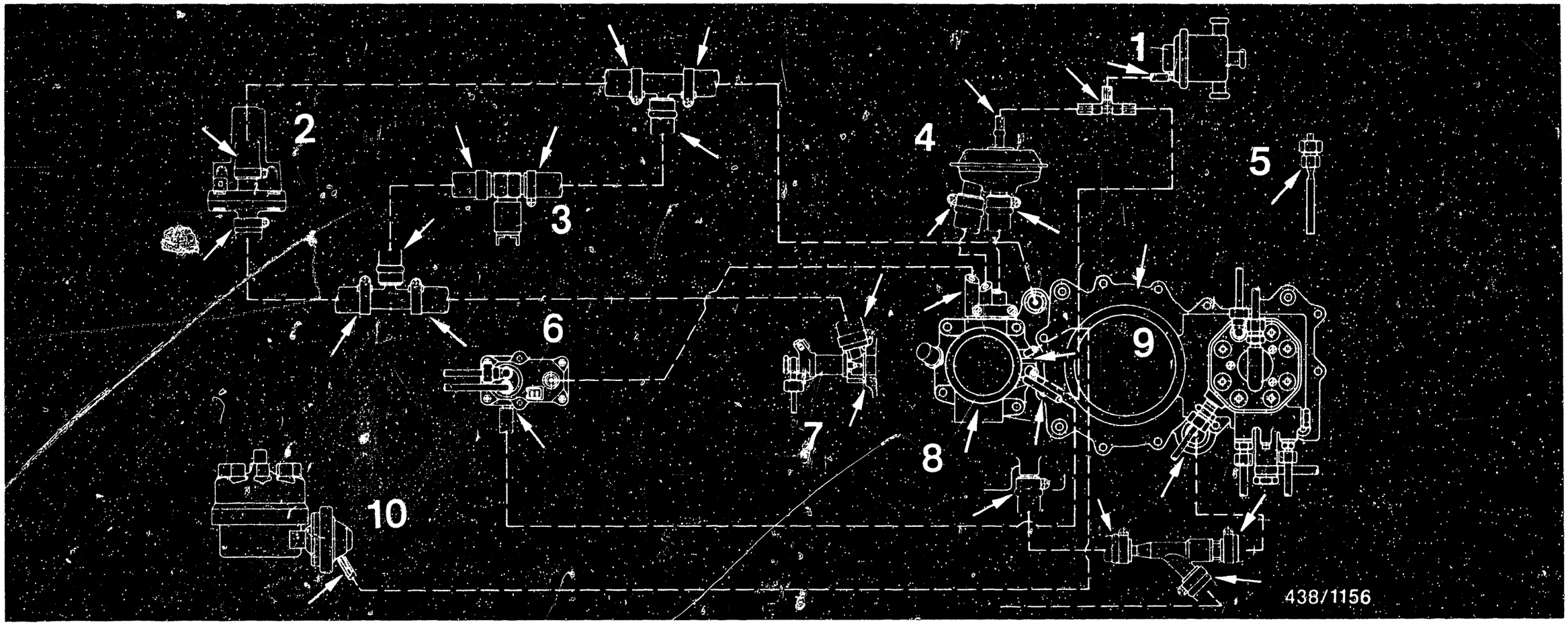
8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Poor throttle take-up with warm engine	11. CO concentration during idling too high	12. CO concentration during idling too low	13. Idle-speed cannot be adjusted (too high)	14. Engine starts but then immediately stops	Cause	Coordinates
		●		●			Vacuum system leaking	C 5
●		●	●	●			Air-flow sensor lever and/or control plunger not moving smoothly	C 9
●							Position of the air-flow sensor plate incorrect	D 3
			●				Control-pressure reduction defective	E 1
					●		Auxiliary-air device does not close	D 8
						●	Electric fuel pump not operating	D 10
							Cold-start system defective	D 20
●	●		●				Cold-start valve leaking	D 20
		●				●	Excessive fuel delivery for control-pressure circuit	E 1
		●				●	"Warm" control pressure too high (after warm-up)	E 1
	●	●	●			●	"Warm" control pressure too low (after warm-up)	E 1
		●				●	Primary (system) pressure outside tolerance	F 1
							Overall fuel system leaking	F 11
●							Injection valves leaking, opening pressure too low	G 15
		●					Unequal fuel delivery (imbalance of fuel delivery)	H 1
●	●	●	●	●			Basic idle adjustment incorrect	H 21
							Throttle plate does not open completely	----



1 = Auxiliary-air change-over valve
2 = Auxiliary-air device
3 = Solenoid-operated valve (only with air conditioner)
4 = Vacuum limiter
5 = Injection valves
6 = Warm-up regulator
7 = Start valve
8 = Throttle-valve assembly
9 = Mixture-control unit
10 = Ignition distributor vacuum unit
11 = Sucking jet pump

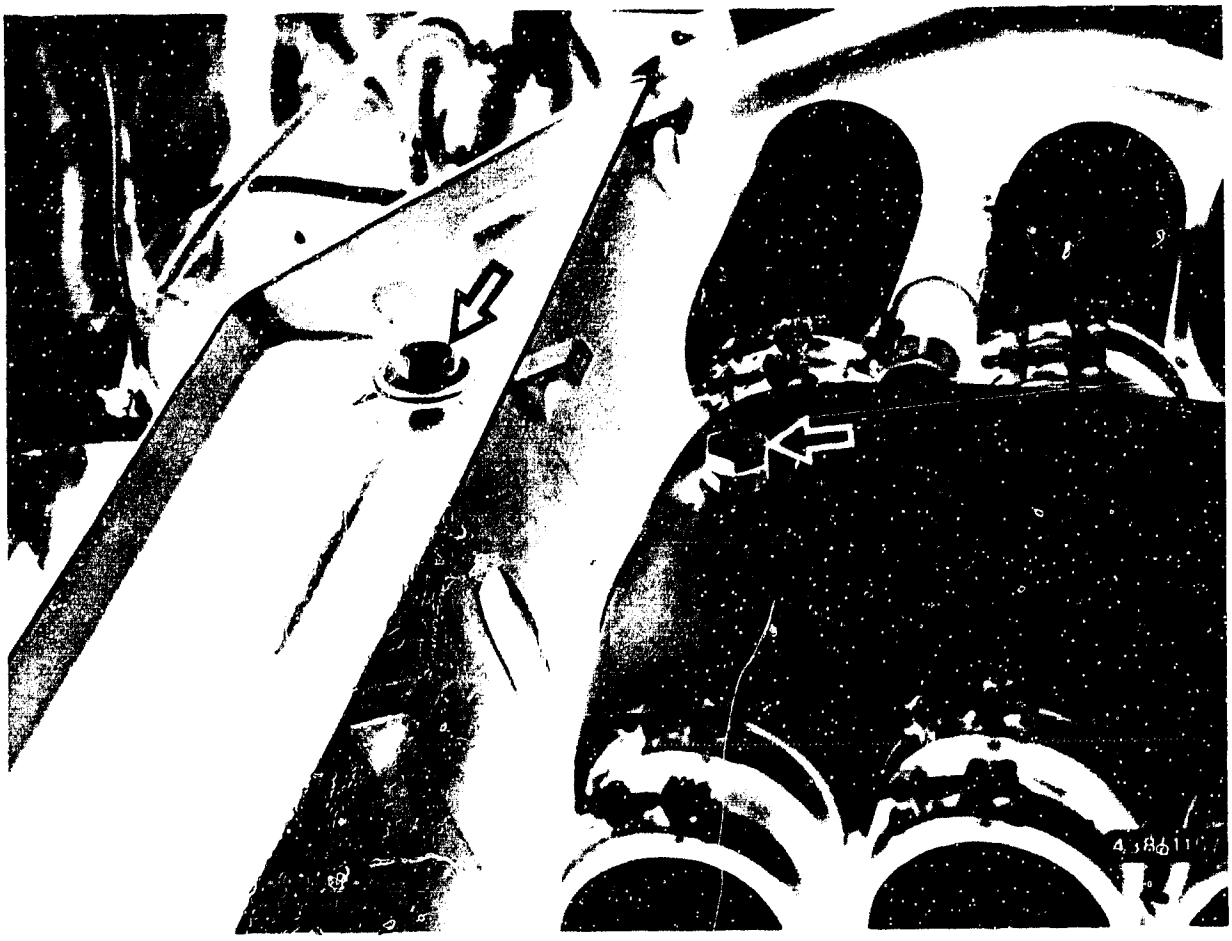
Test steps

8. Testing the engine air-intake system for leaks



The arrows in the diagram show typical points where leaks can occur. Check by performing a visual inspection or,in cases of doubt, as follows:Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intakte system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water,or spray with leak detector(e.g. Güpoflex).
Under no circumstances may combustible liquids be used when testing for leaks.

The formation of bubbles or foam indicates a leak. If a leak has been eliminated,id is necessary finally to adjust the idle speed with the engine at normal operating temperature: Idle-speed adjustment is described on Coordinates H 21.

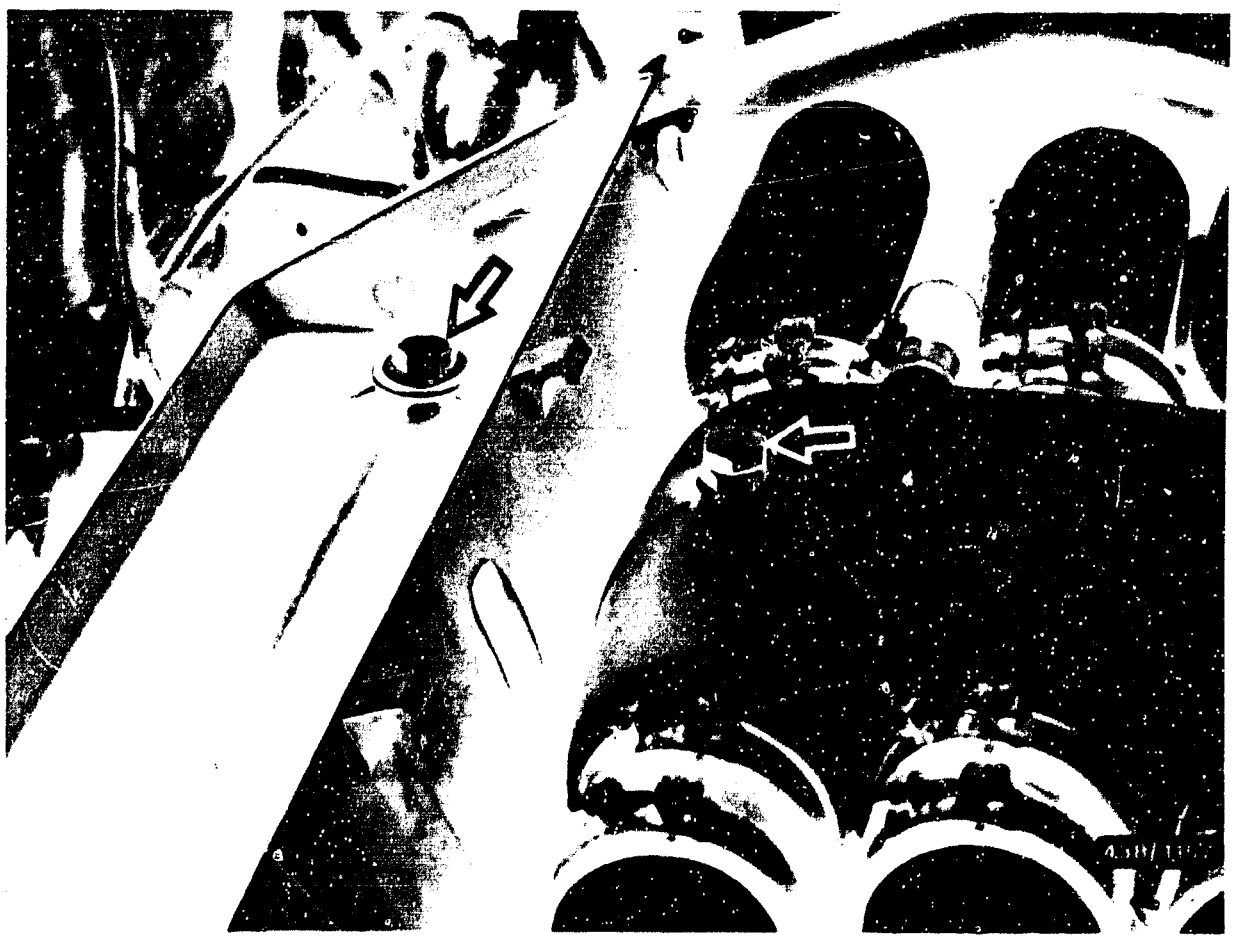


9. Testing the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement

9.1 Preparations:

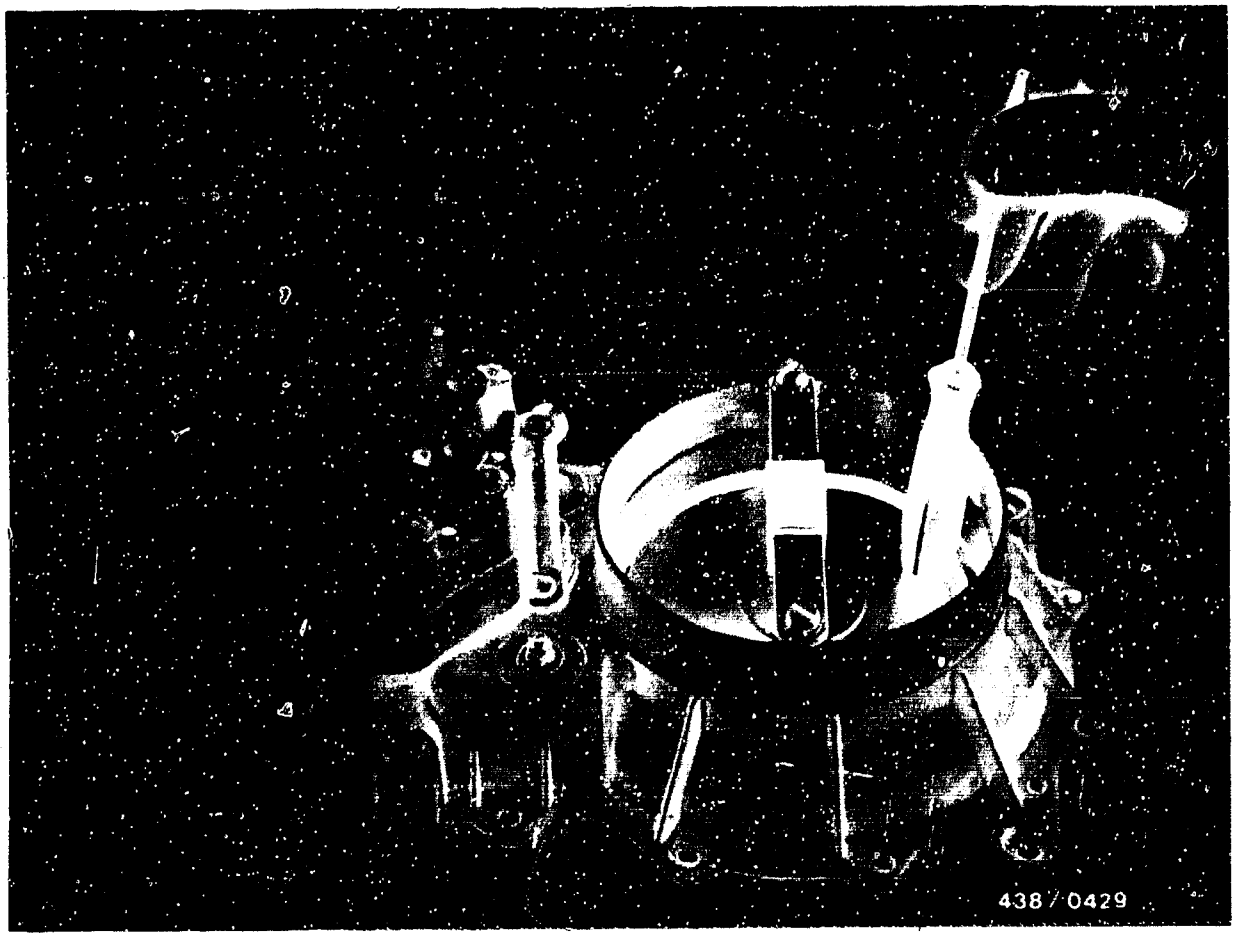
- Engine temperature not below 20°C
- Remove air filter and air-filter housing as follows so that mixture-control unit is made accessible:

  Remove both air-intake hoses. Remove air filter top part (unhook 4 clamping bands).



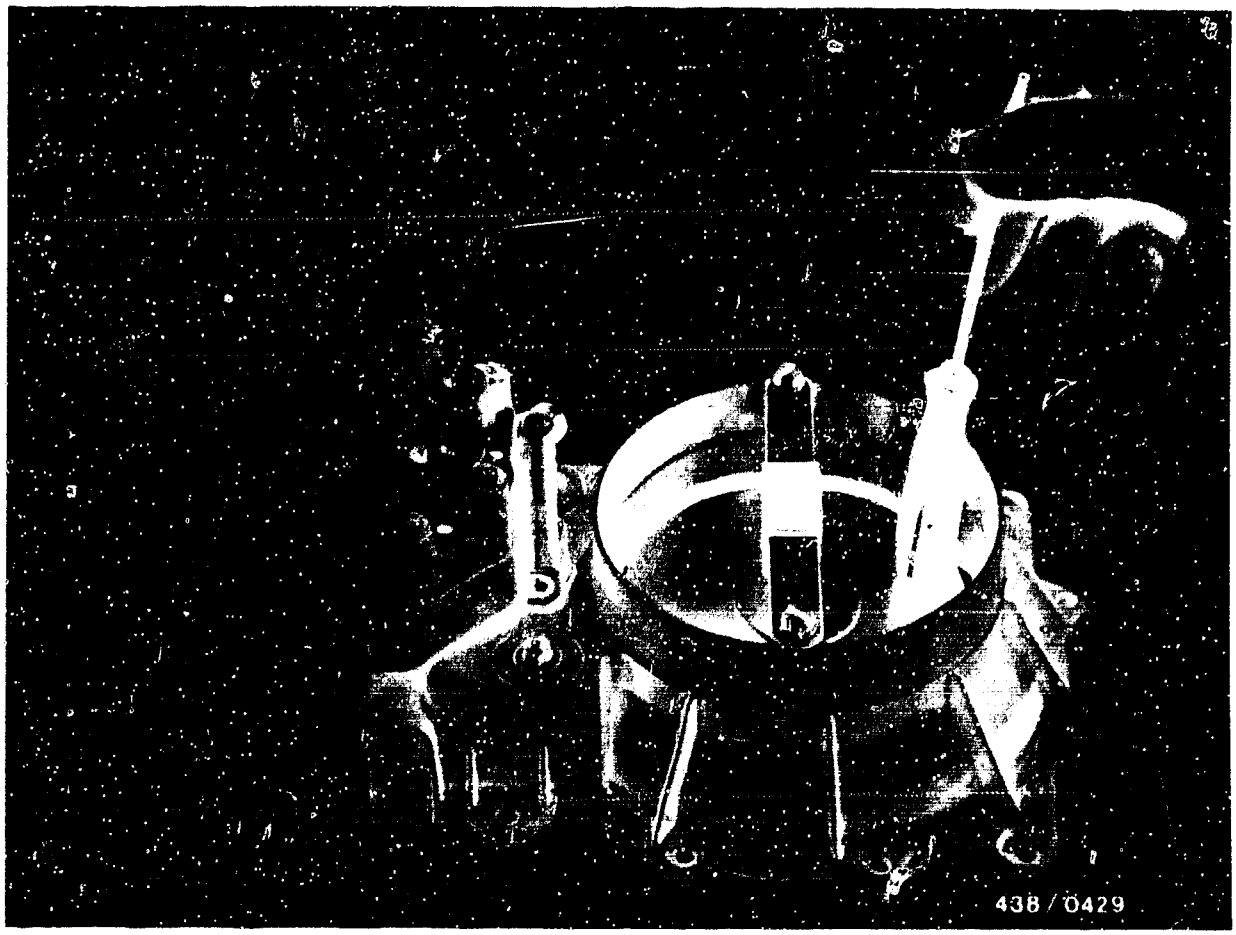
Unscrew the pressure screw in the intake manifold as well as the fastening screws in the air-filter housing (arrows), and remove filter housing to the right.

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit. This applies control pressure to the control plunger in the fuel distributor.



9.2 Check that the control lever moves freely

Depress the air-flow sensor plate by hand (downdraft) and release. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.
If the control lever moves freely once the fastening screws are released, then the seal between the air-feed housing and the air-flow sensor should be replaced (Porsche service part).
Tighten the screws uniformly cross-wise. If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely

Depress the air-flow sensor plate by hand (downdraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows this rapid movement of the sensor plate only sluggishly, and therefore initially loses contact with the sensor plate lever. It must be possible, however, to feel the plunger make contact with this lever again. If this condition is fulfilled, the control plunger can be considered to move freely.

If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

Important!

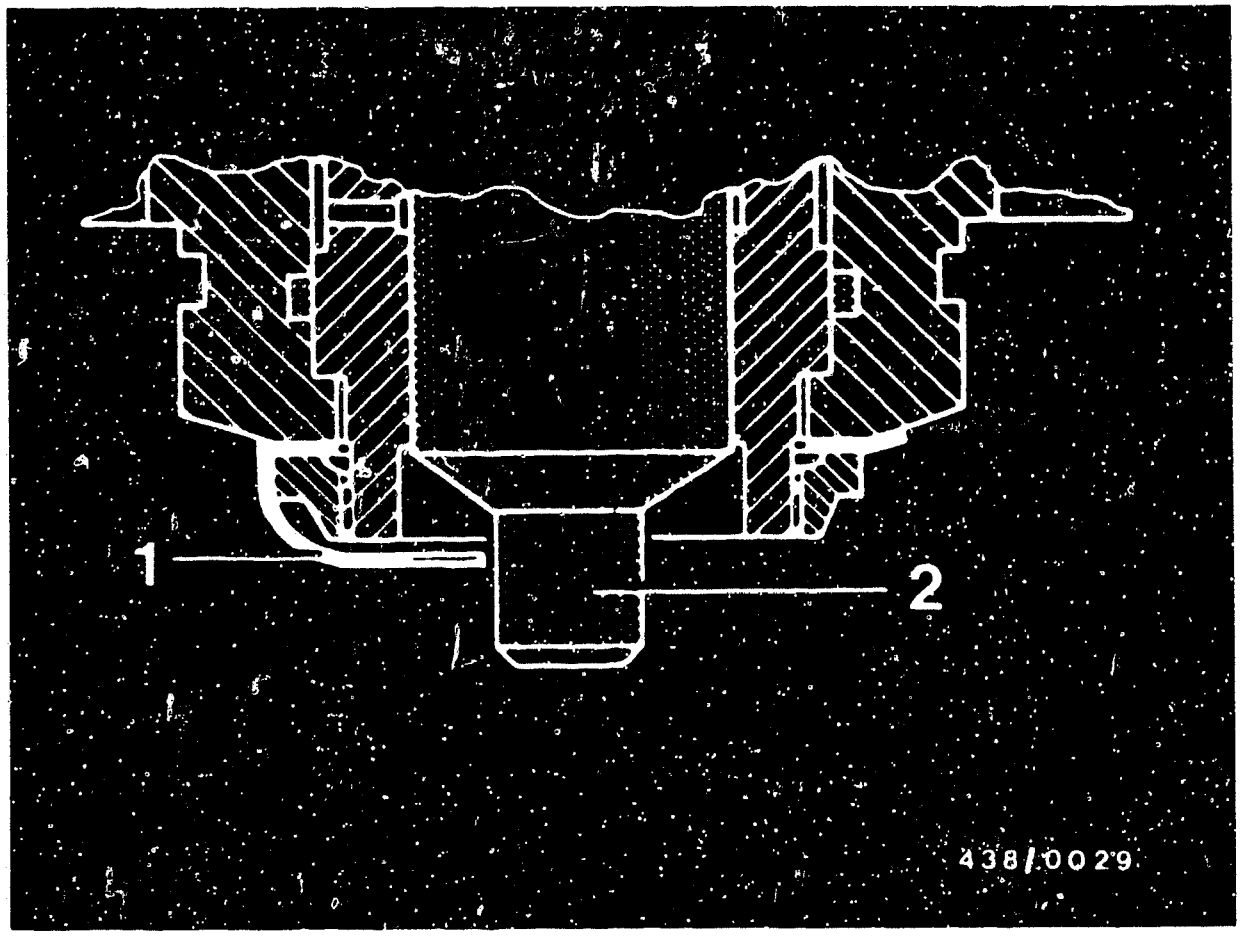
Note the following when mounting fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt may enter the fuel system.

When loosening or tightening the fuel connections, hold the fixed hexagonal section of the component with a wrench.

Thoroughly clean fuel distributor in the region of the fuel connections. Unscrew all connections.

Unscrew the three fastening screws of the fuel distributor and remove fuel distributor from air-flow sensor.

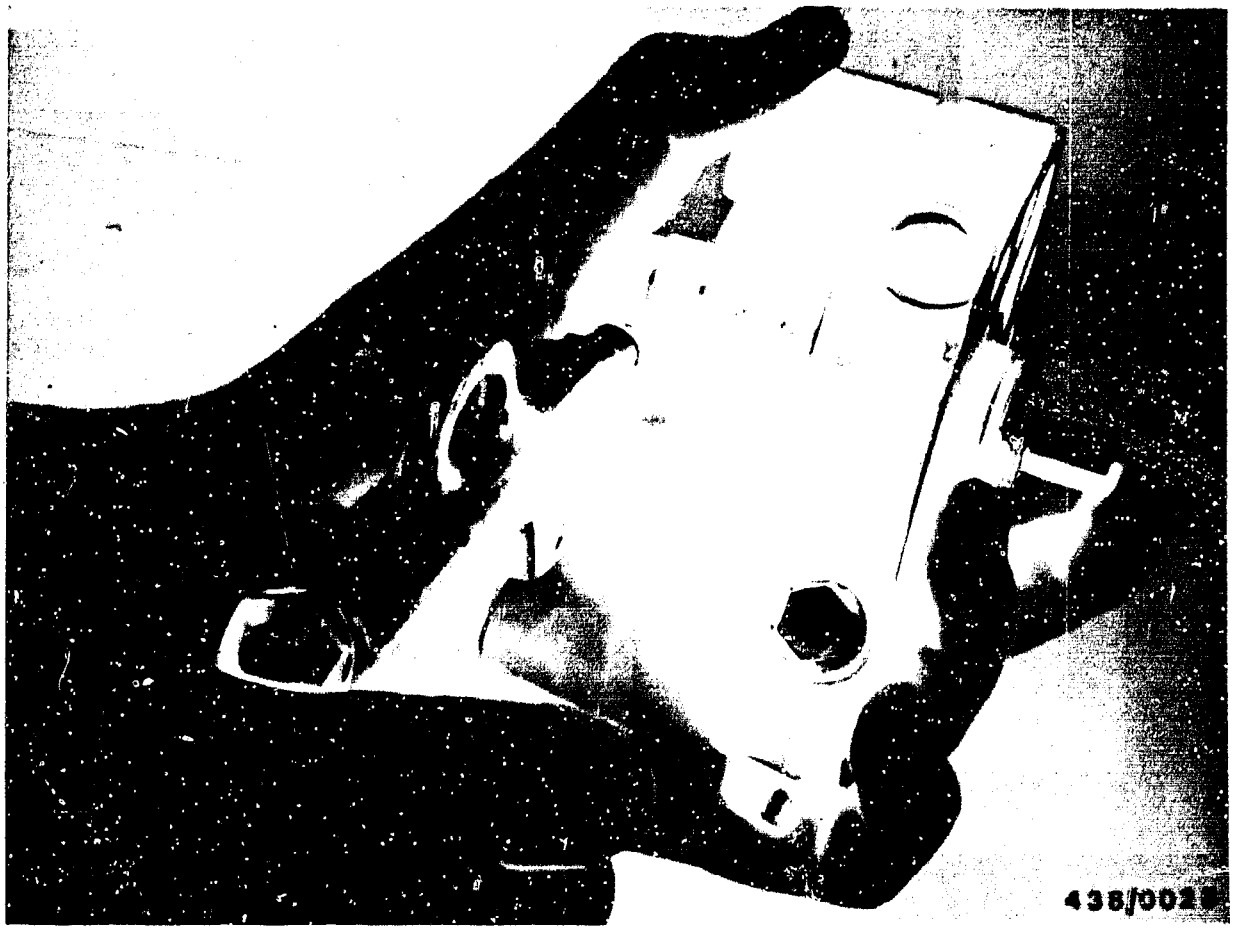


1 = Drop-out safeguard
2 = Control plunger

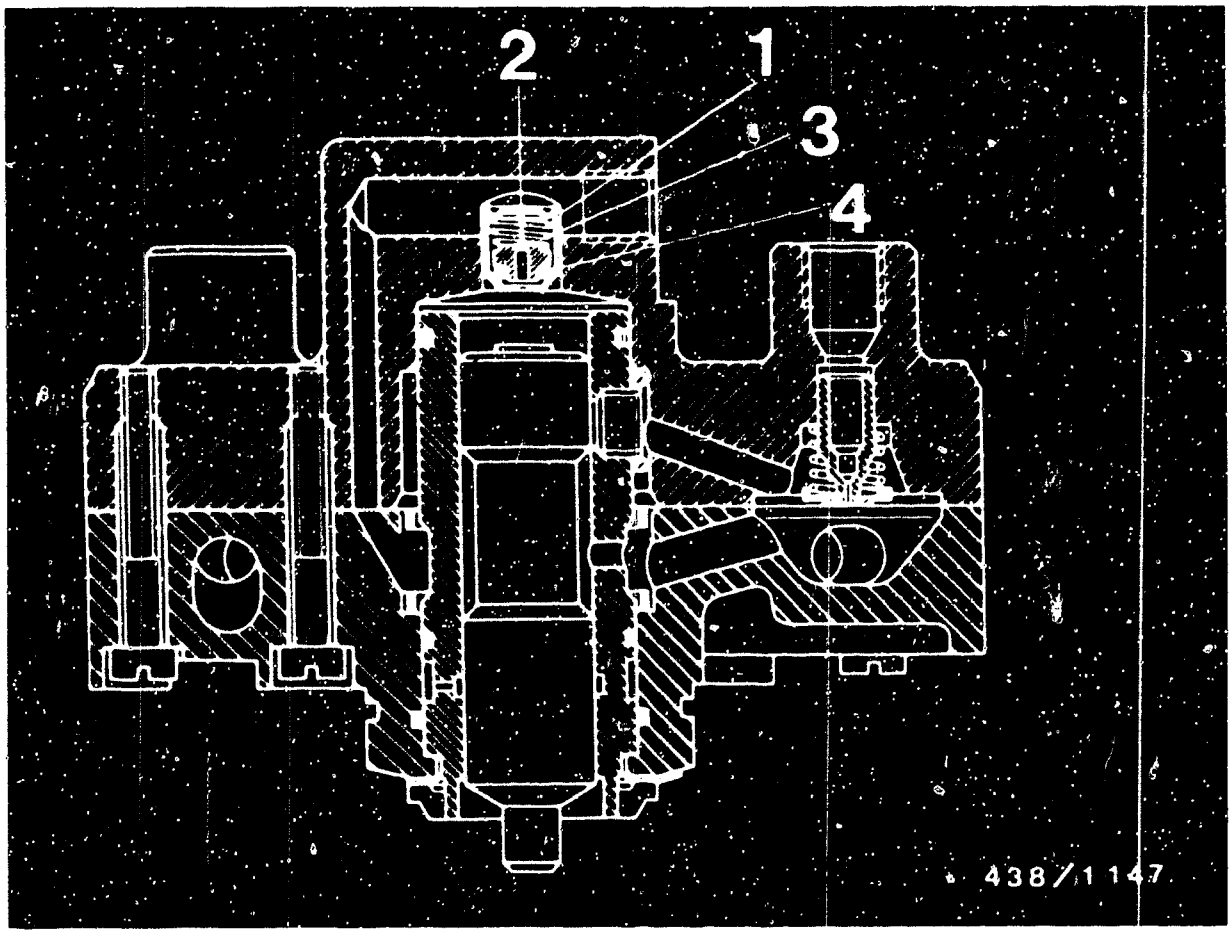
Note: The fuel distributor in the Porsche 928 and 928 S is equipped with a drop-out safeguard for the control plunger.

This metal drop-out safeguard also serves as a transit protection device and to facilitate assembly.

The safeguard must not be loosened or removed. However, it may be bent back so that the control plunger can be withdrawn from the fuel distributor for testing and cleaning.



Remove plunger. It may be necessary briefly to apply compressed air to the plunger through the control-pressure connection port. Hold plunger firmly with your hand when doing this. Thoroughly clean plunger with benzine. If this does not provide the required ease of movement, replace the fuel distributor.



1 = Capsule valve
2 = Restriction bore
3 = Valve spring
4 = Valve piston with seal ring

Special information on replacing the fuel distributor:

As of the 1981 model year the Porsche models 928 and 928 S are equipped with a fuel distributor with capsule valve (instead of non-adjustable flow control valve) (see diagram).
This results in an improved transient response (throttle take-up), particularly during the warm-up phase.

In a service bulletin Porsche has informed its own service organization of the modification to the fuel distributor and has ordered that after stocks have been used up only the 1981 model fuel distributor (with capsule valve) is to be installed also in earlier vehicles (model years 1978 to 1980), should it be necessary to replace the fuel distributor.

We endorse this procedure for the Bosch After-Sales Service Organization.

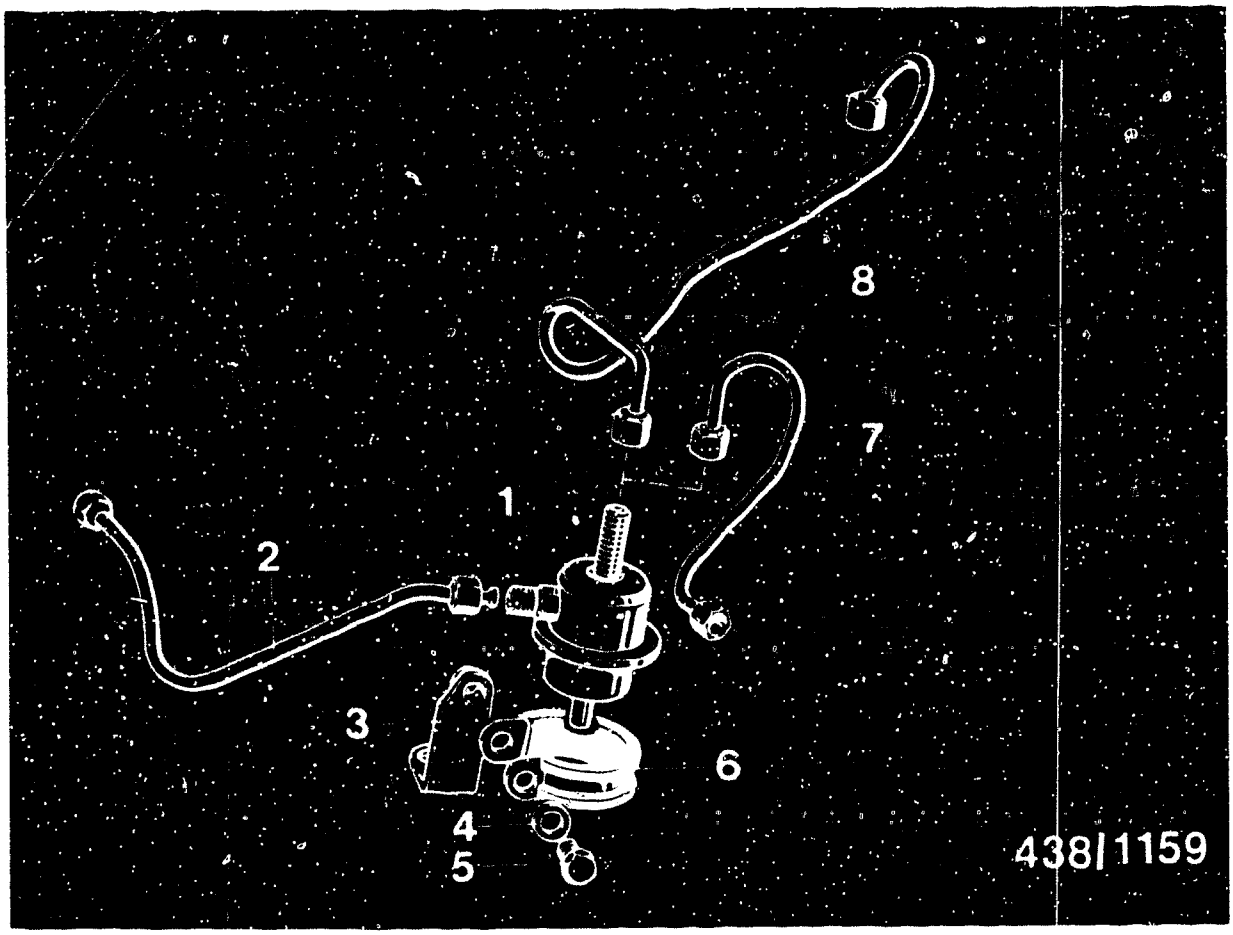
This modification to the fuel distributor was performed without changing the part number, but the respective version can be identified by the colour of the name-plate.

Fuel distributor part number: 0 438 100 027

Colour of nameplate:

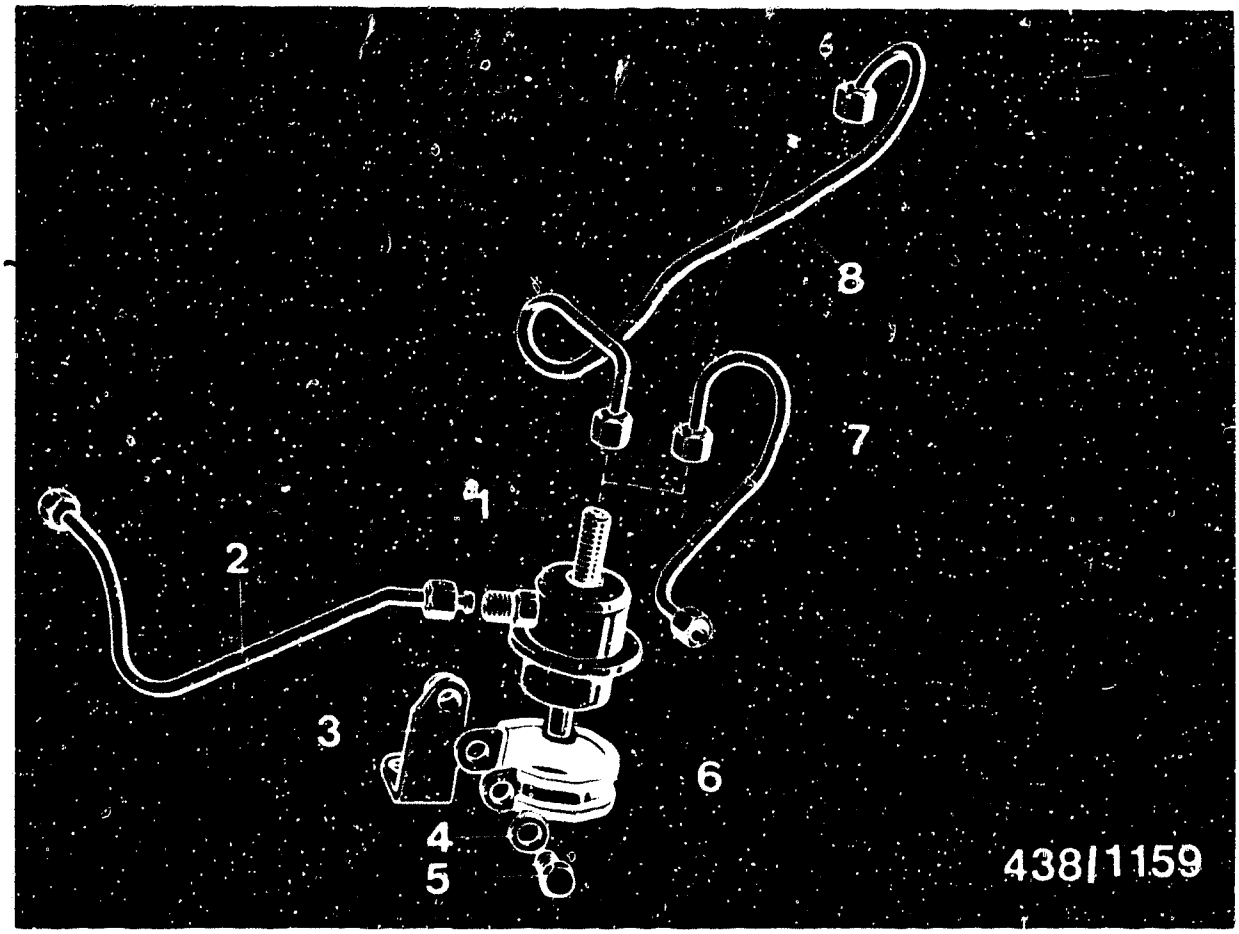
Fuel distributor with non-adjustable flow control valve, earlier version	red
Fuel distributor with capsule valve, as of 1981 model:	black/red

The introduction of the fuel distributor with capsule valve also required the installation of a fuel-line-pressure damper in the control-pressure line from the fuel distributor to the warm-up regulator. This is also absolutely essential if the new fuel distributor is retrofitted in earlier vehicles. The retrofitting of the fuel-line-pressure damper is described on the following coordinates.



Installing the fuel-line-pressure damper:

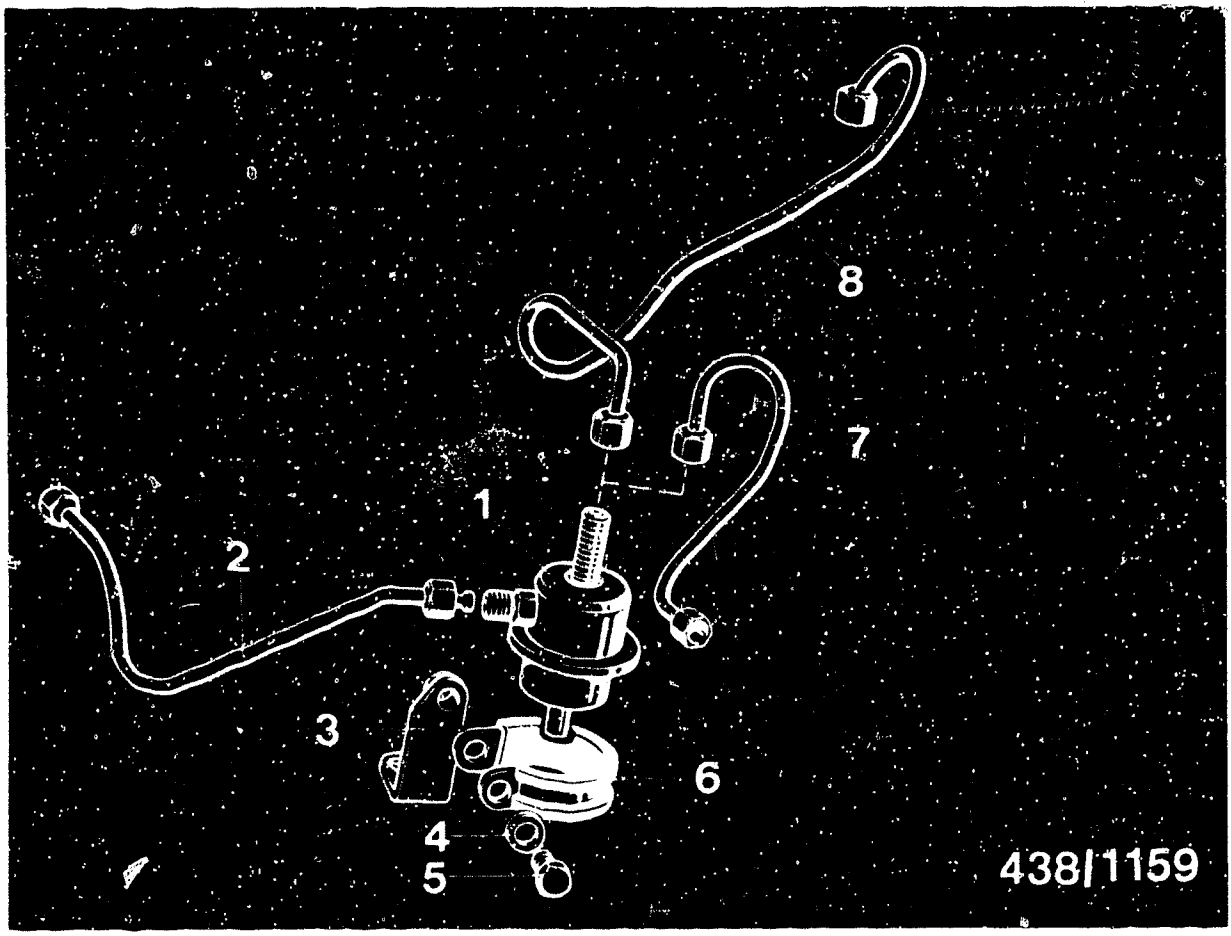
In addition to the Bosch fuel-line-pressure damper, various fasteners and connecting lines are required for installation. These should be obtained from your Porsche agent. The choice of the correct lines and the correct method of connection depend on whether the engine is equipped with the additional device for control-pressure reduction (control-pressure-reduction valve).



Parts required:

1 = Fuel-line pressure damper Bosch No. 0 280 161 007

2 = Fuel line from fuel distributor to pressure damper	Porsche Part		928.110.505.01
3 = Angle bracket	"	"	928.110.231.02
4 = Plain washer	"	"	N 011.524.7
5 = Screw M 6x12	"	"	N 010.212.14
6 = Fastening clamp	"	"	999.110.525.00

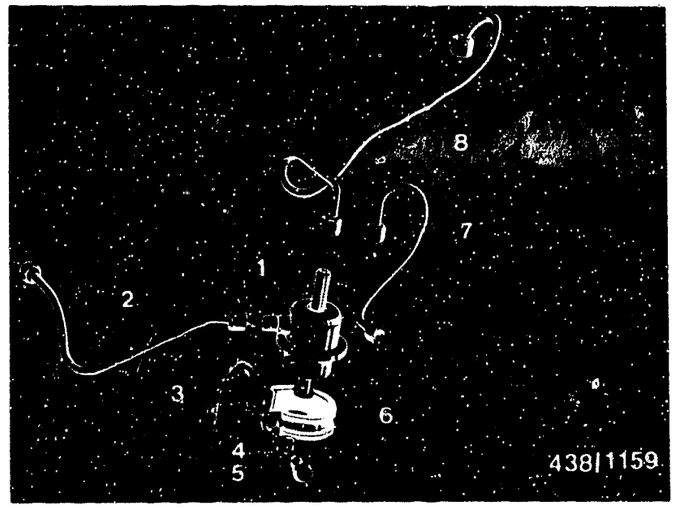


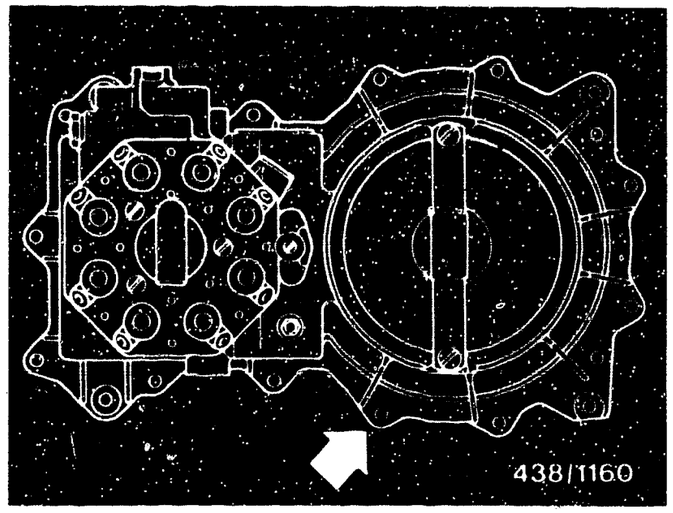
7 = Fuel line
from pressure damper
to control-pressure-
reduction valve — Porsche Part 928.110.503.00

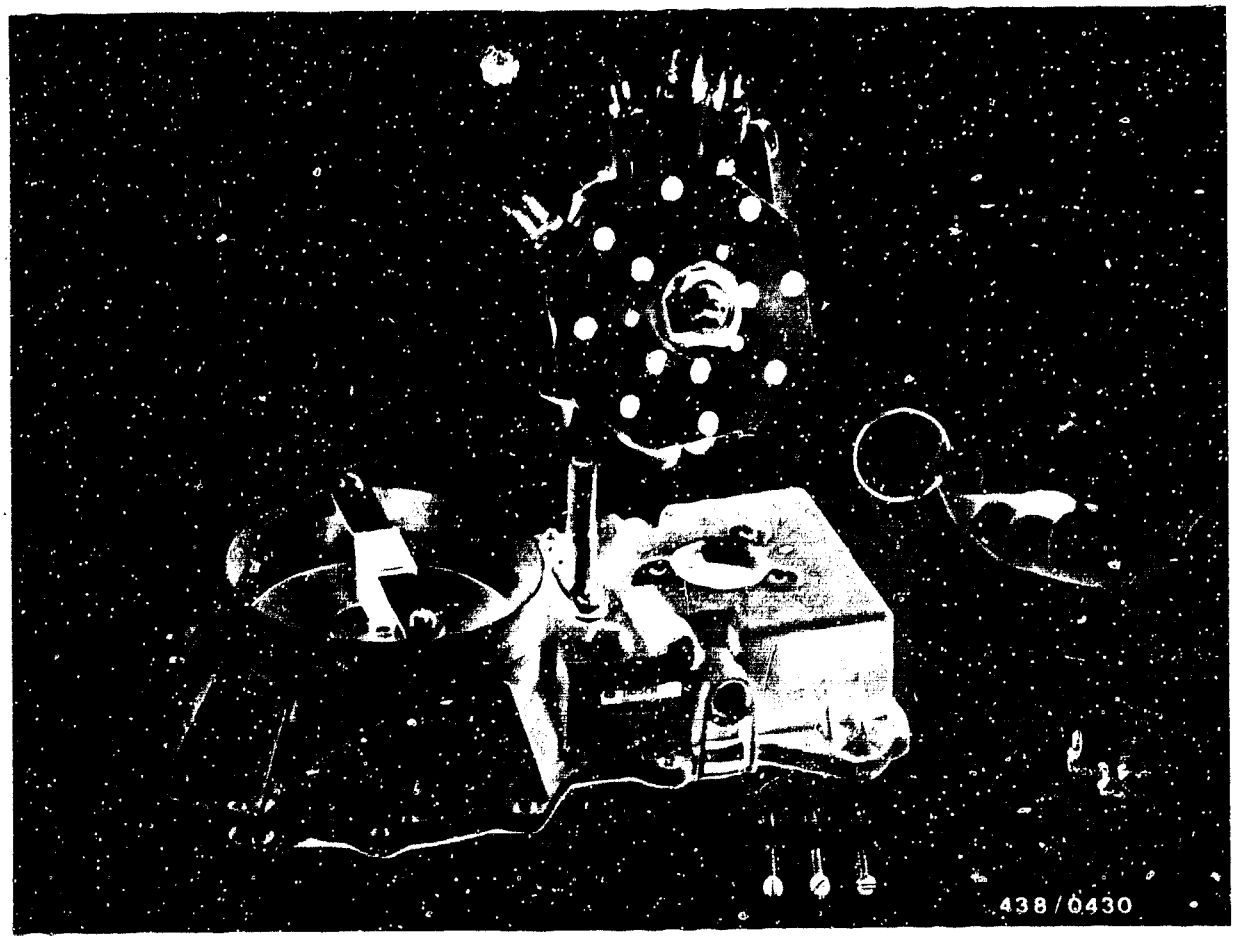
8 = Fuel line
from pressure damper
to warm-up regulator,
for version without
control-pressure
reduction — " " 928.110.189.05

Installation:

- Remove cylinder 4 intake port.
- Remove fuel line (control-pressure line) from fuel distributor to warm-up regulator, or from fuel distributor to control-pressure-reduction valve (if fitted).
- Secure the angle bracket (Item 3) using the screw of the air-flow sensor mounting hole identified by an arrow in the picture.
- Mount pressure damper (Item 1) on angle bracket with fastening clamp (Item 6), screw (5) and washer (4). Initially, only finger-tighten screw.
- Install fuel line from fuel distributor to pressure damper (side connection).
- Install fuel line from pressure damper (upper connection) to warm-up regulator (Item 8), or from pressure damper to control-pressure-reduction valve (if fitted, Item 7).
  Tightening torque of union nuts: 20 Nm.
- Finally tighten fastening screw of fastening clamp.
- Re-install cylinder 4 intake port, possibly using a new flange seal. Tighten hose bands securely.



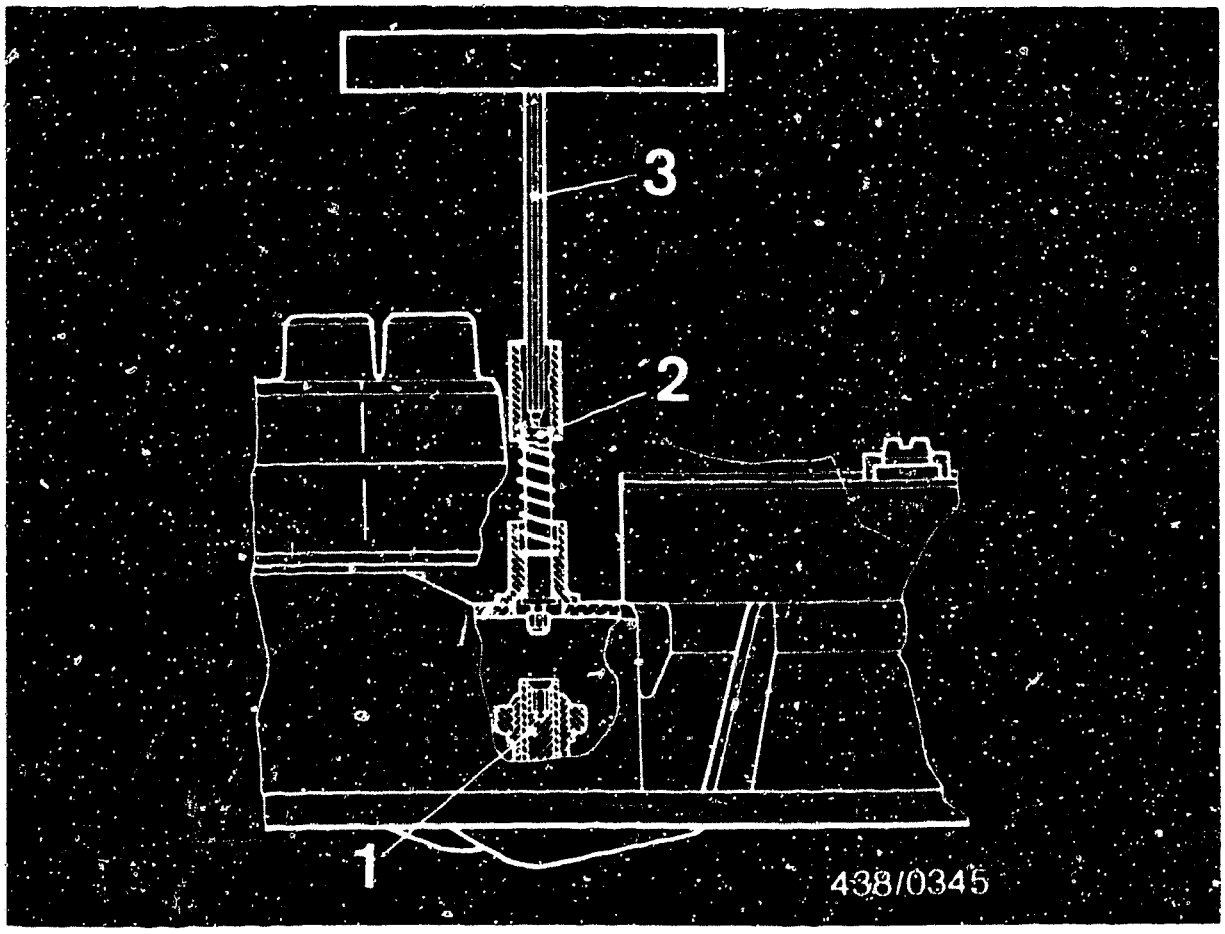




9.5 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor.
Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.
When connecting the fuel-injection tubing, use new seal rings.

Caution:
The connecting screws of the injection lines on the fuel distributor should only be tightened to a torque of 10...12 Nm (1...1.2 kgfm). If they are overtightened, there is the danger that the lines will be crushed.

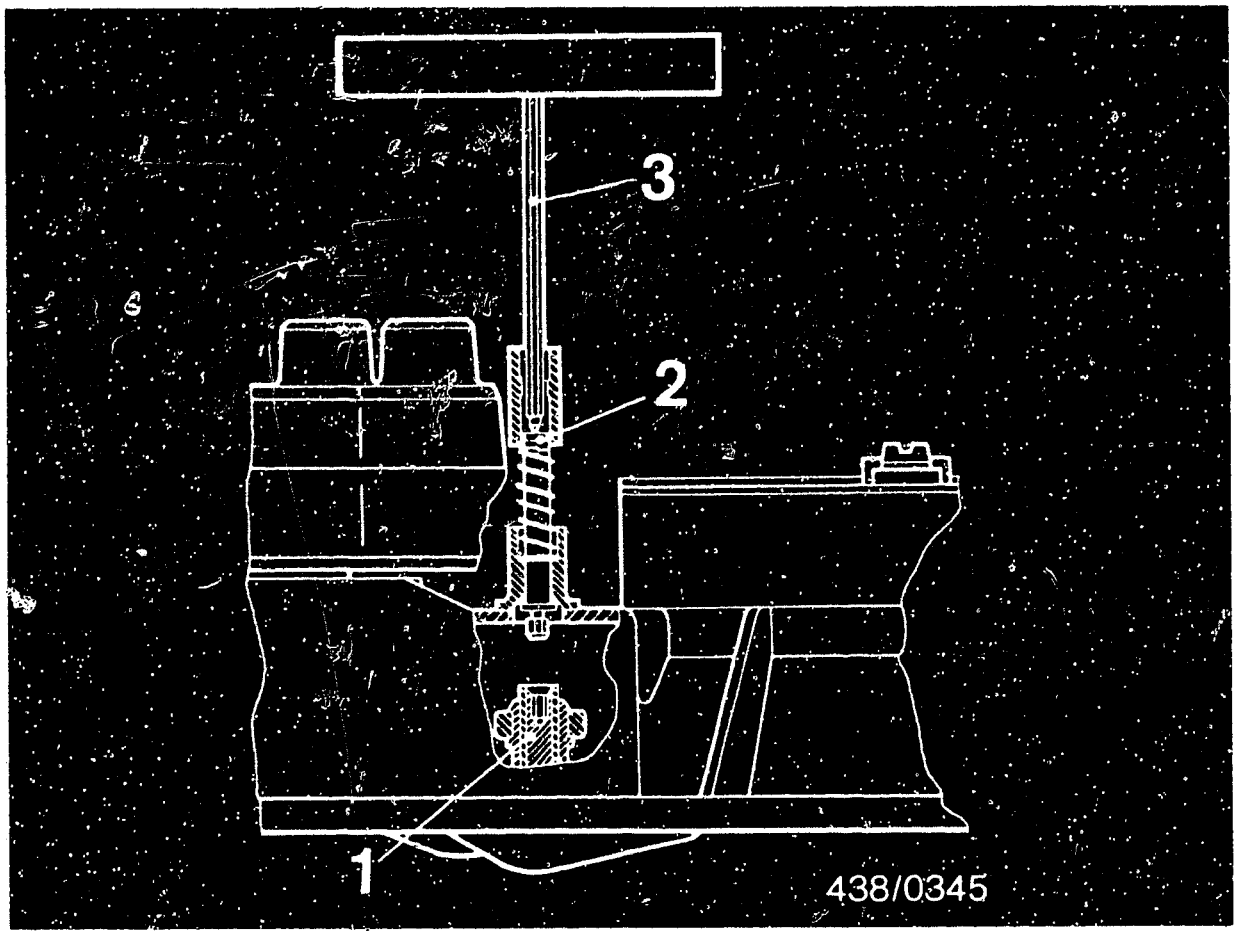


1 = Idle-mixture-adjusting screw
2 = Setting device
3 = Adjusting wrench

9.6 Matching the fuel distributor to the air-flow sensor for initial starting:

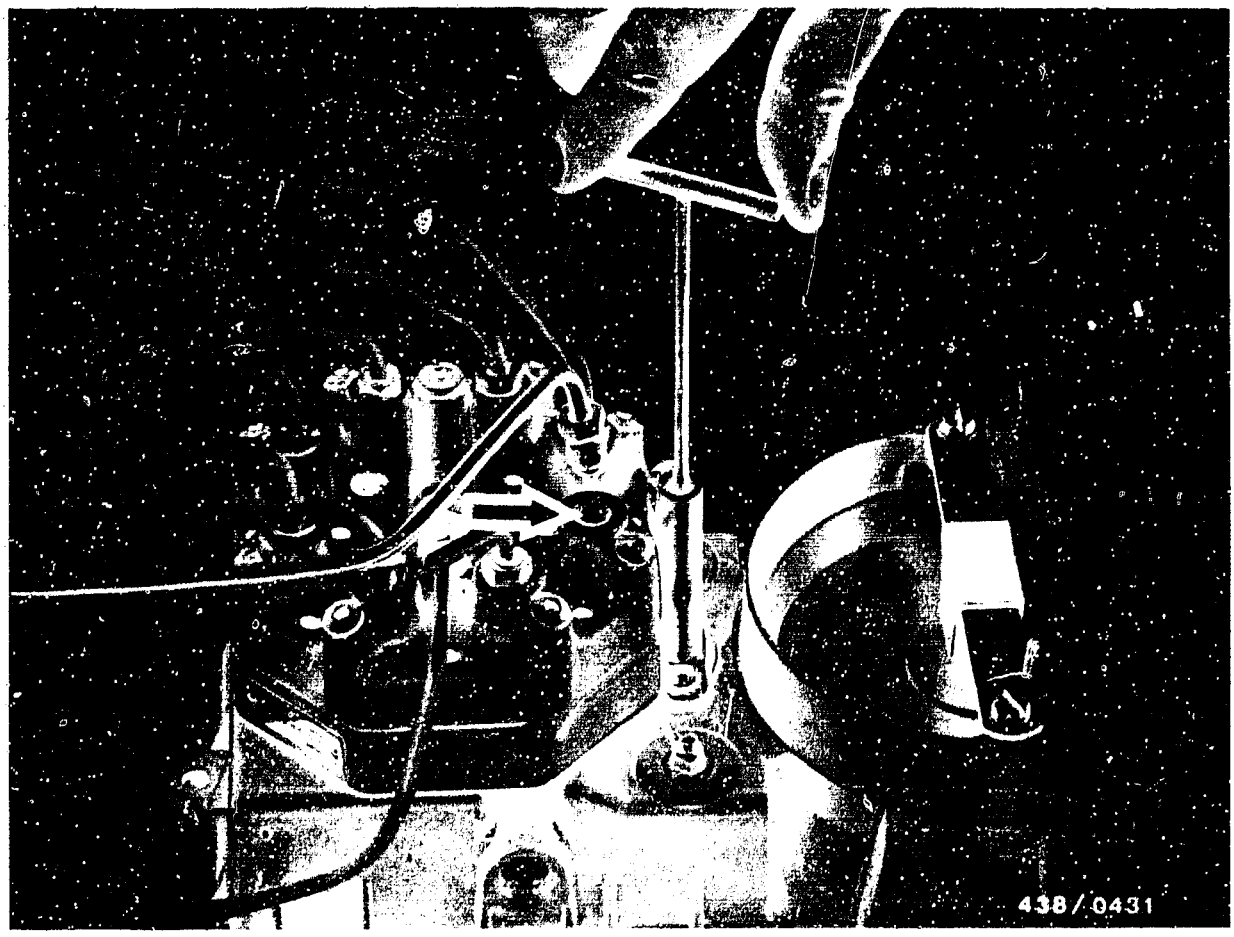
Unscrew one injection line from the fuel distributor. Bridge electrical safety circuit so that the electric fuel pump operates.

The idle-mixture-adjusting screw is adjusted by means of a setting device with spring-loaded pin wrench which is permanently mounted on the mixture-control unit.



1 = Idle-mixture-adjusting screw
2 = Setting device
3 = Adjusting wrench

To adjust, carefully depress pin wrench of setting device with the aid of the adjusting wrench until it locks into the idle-mixture-adjusting screw.

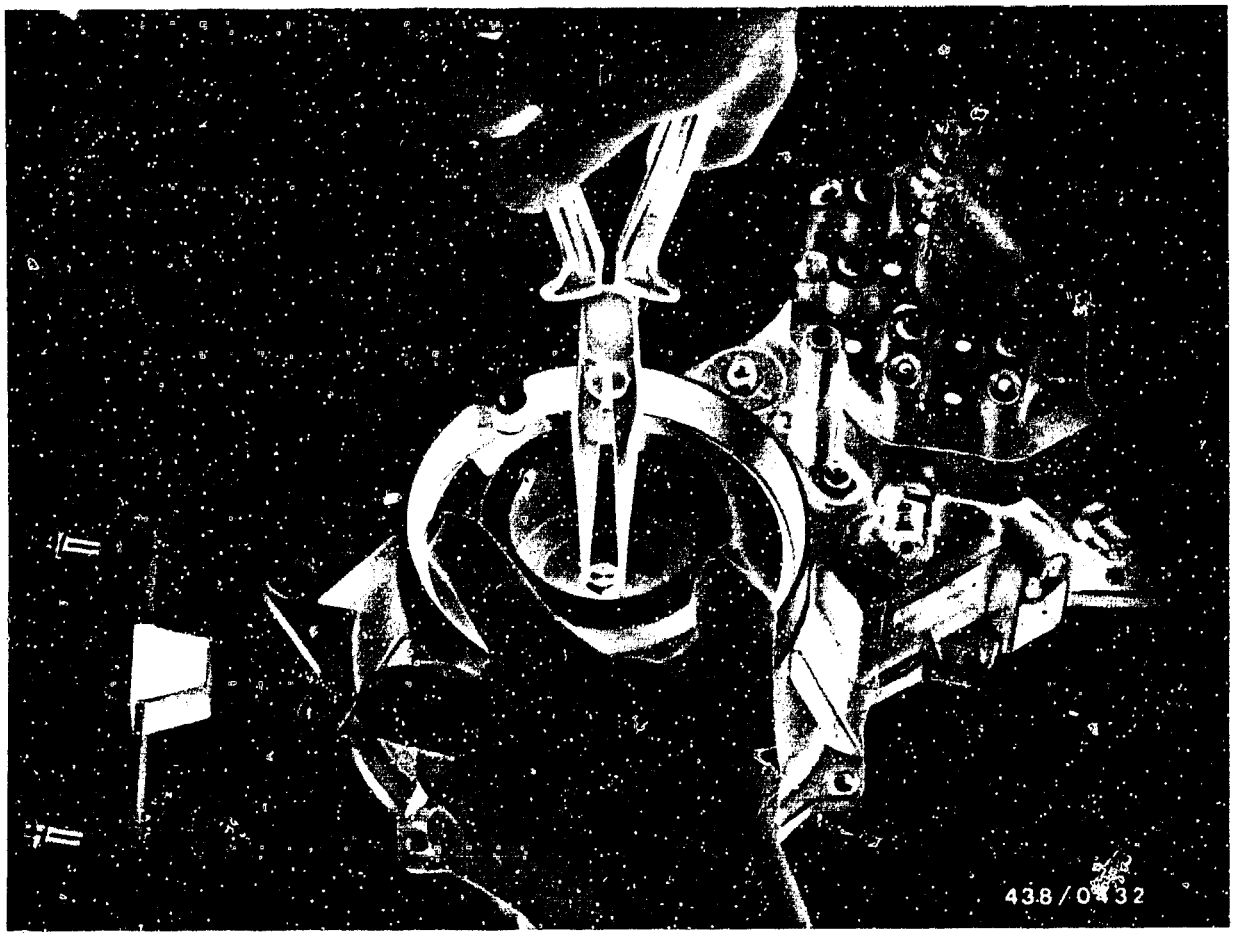


Screw in the idle-mixture-adjusting screw slowly and without any great pressure on the adjusting wrench until there is just a flow of fuel from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Reconnect fuel line to fuel distributor, start engine and warm up.

The final matching of air-flow sensor and fuel distributor is performed finally by means of the idle adjustment with the engine at normal operating temperature.

The idle adjustment is described on Coordinate H 21.



10. Checking and adjusting the position of the air-flow sensor plate

10.1 Preparations

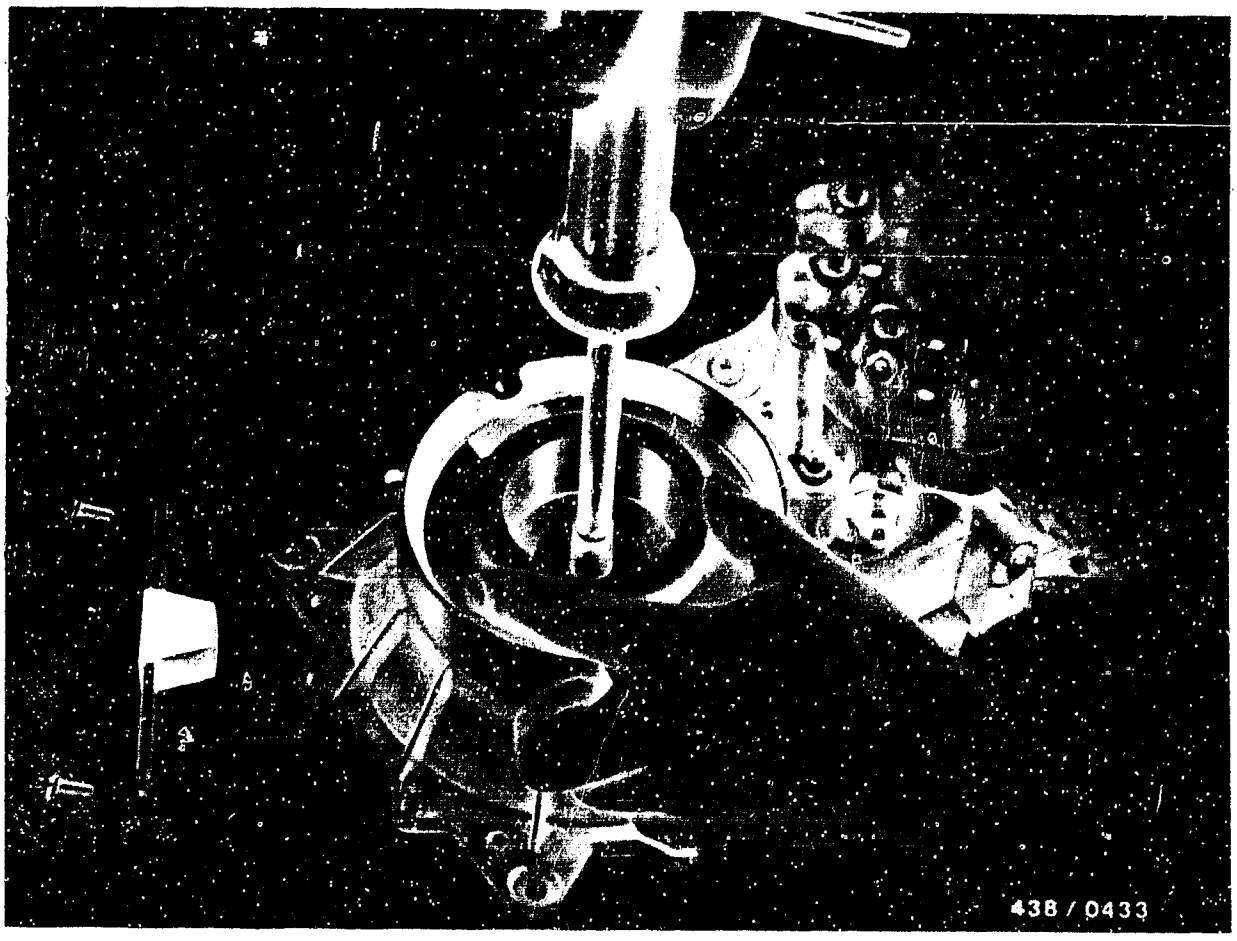
- Engine temperature is not important.
- Remove air filter to make air-flow sensor plate accessible.

10.2 Centering the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/15 (dia. 105 mm) as follows:

Remove the stop bracket after loosening the two fastening screws.

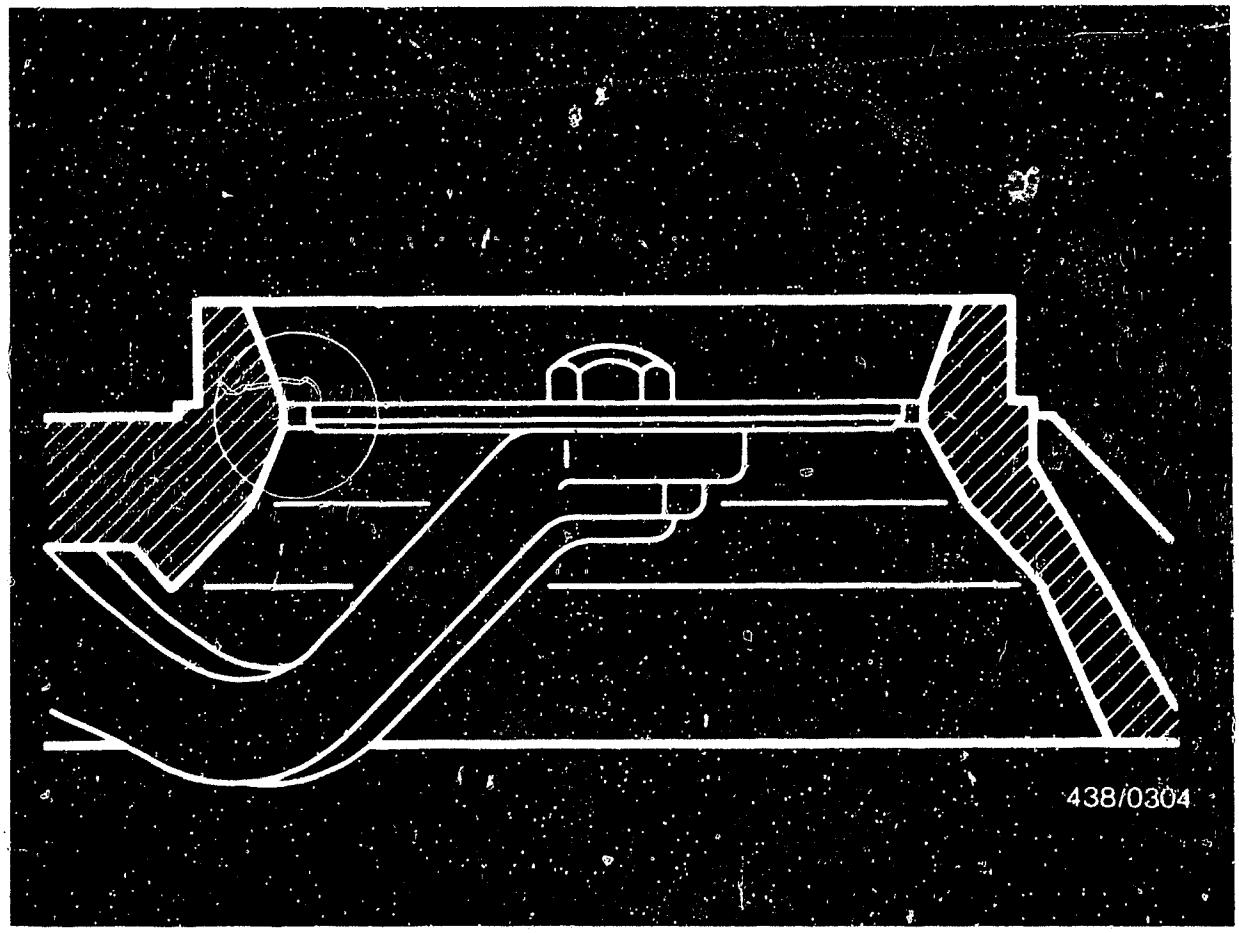
Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screws with pliers so that the sensor plate does not deflect downwards.



With the locating ring inserted, tighten fastening screw to 5.0...5.5 Nm, loosen again and tighten again to the same torque.

When tightening the screw, make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

It must not be possible to turn the sensor plate by hand.

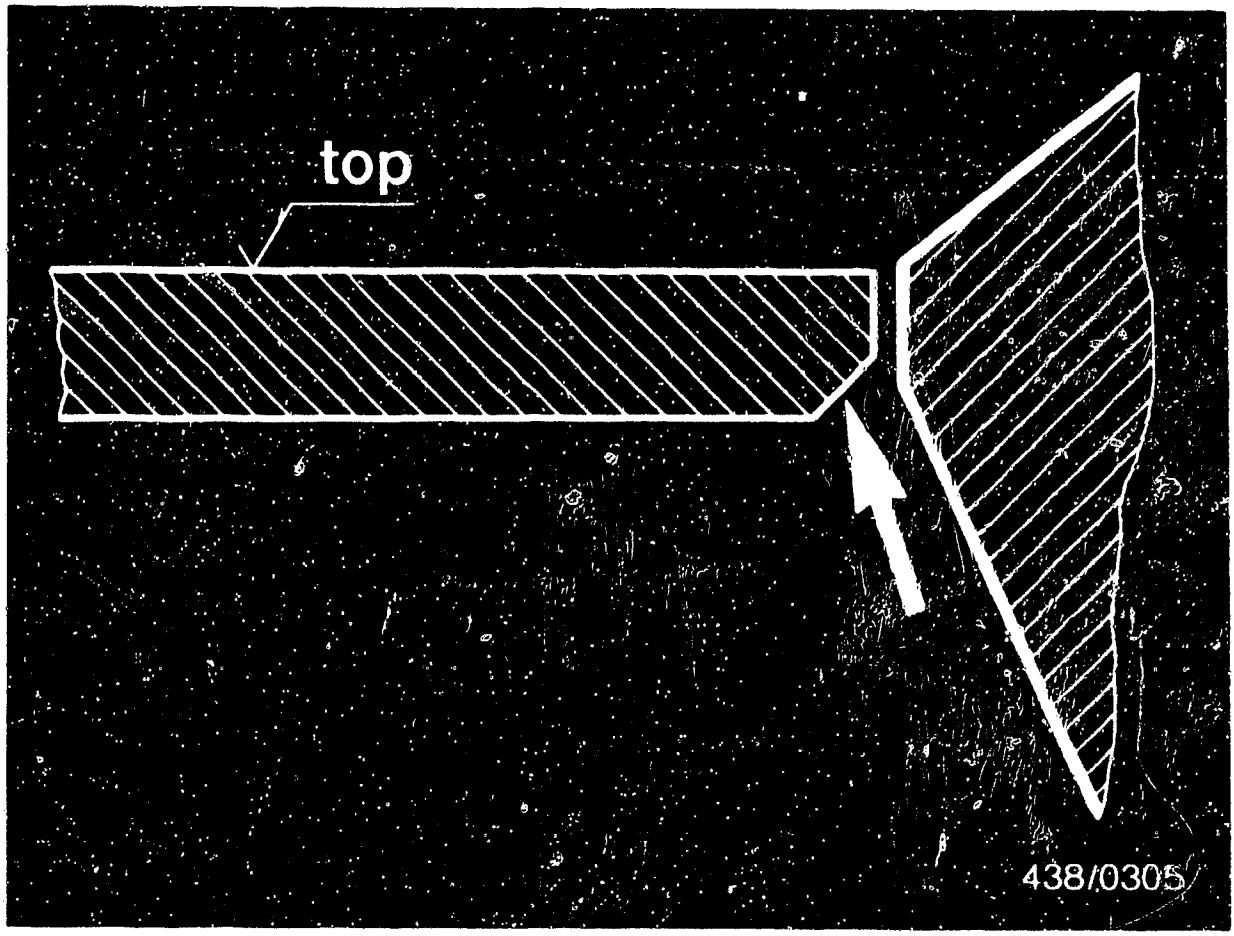


10.3 Testing and adjusting the zero position of the air-flow sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This applies control pressure to the control plunger in the fuel distributor.

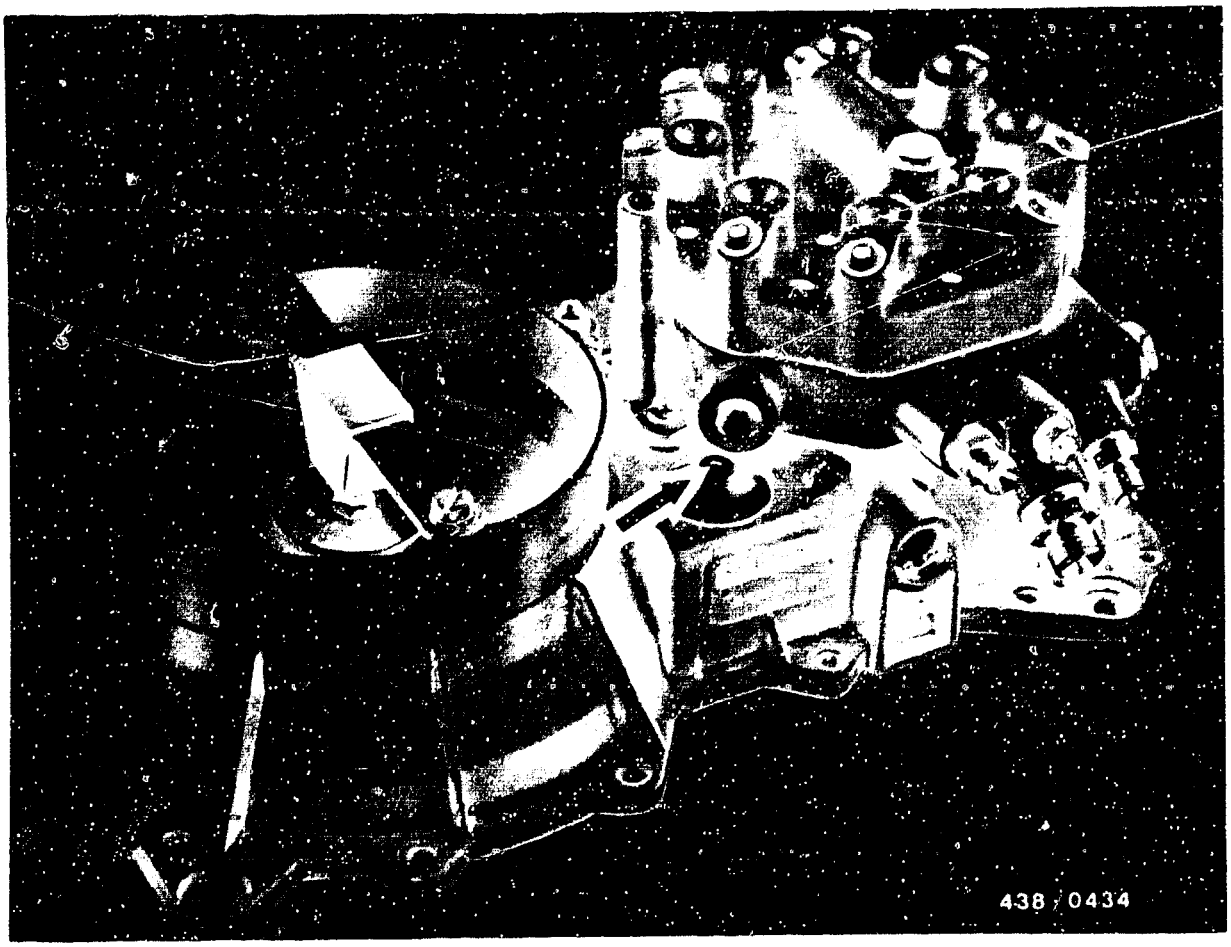
The top edge of the sensor plate must be flush with the start of the conical section (relief cone at top) or max. 0.5 mm higher.

The sensor plate must be flat and must not project beyond the cylindrical part of the air funnel at any point on its circumference.



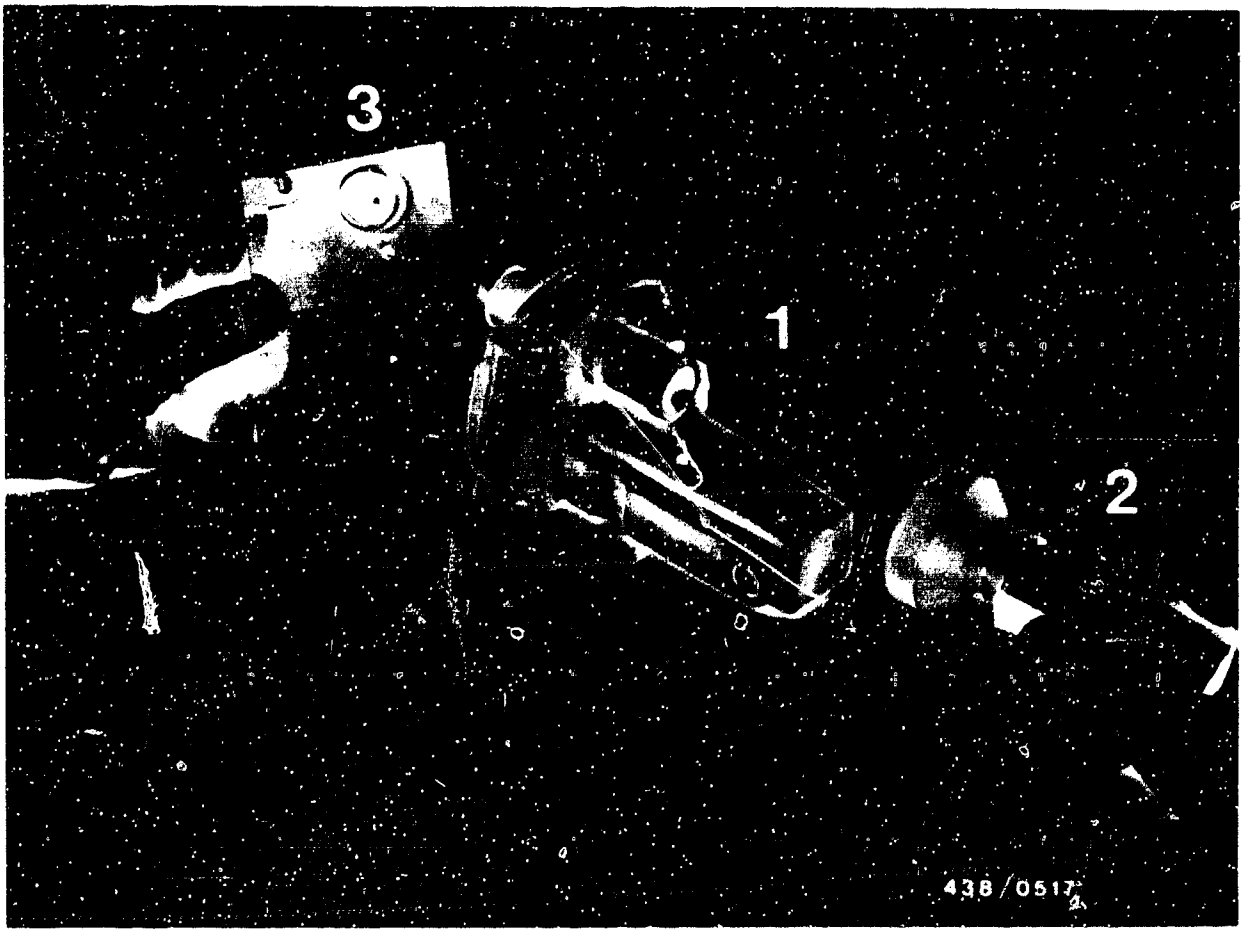
Caution:

There is a chamfer on the underside of the sensor plate. Ensure that the chamfer is at the bottom (arrow). The word "top" is stamped (in some cases) on the top side of the sensor plate.



If the sensor plate is too high, it is possible to make an adjustment. To do this, drive the guide pin (arrow) of the stop leaf spring correspondingly deeper using a mandrel and a light hammer.

Caution:
Adjust very carefully so that guide pin is not driven in too deep.
Be sure to avoid repeated adjusting in both directions since the force fit of the pin will become too loose.
If the pin drops out this can lead to serious engine damage.



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

11. Checking the operation of the auxiliary-air device

The engine must be cold.
Disconnect the plugs from the auxiliary-air device and warm-up regulator.
Disconnect both air hoses from the auxiliary-air device. Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

- If an opening is not visible with the engine cold, replace the auxiliary-air device.

- Fit the plug on the auxiliary-air device.

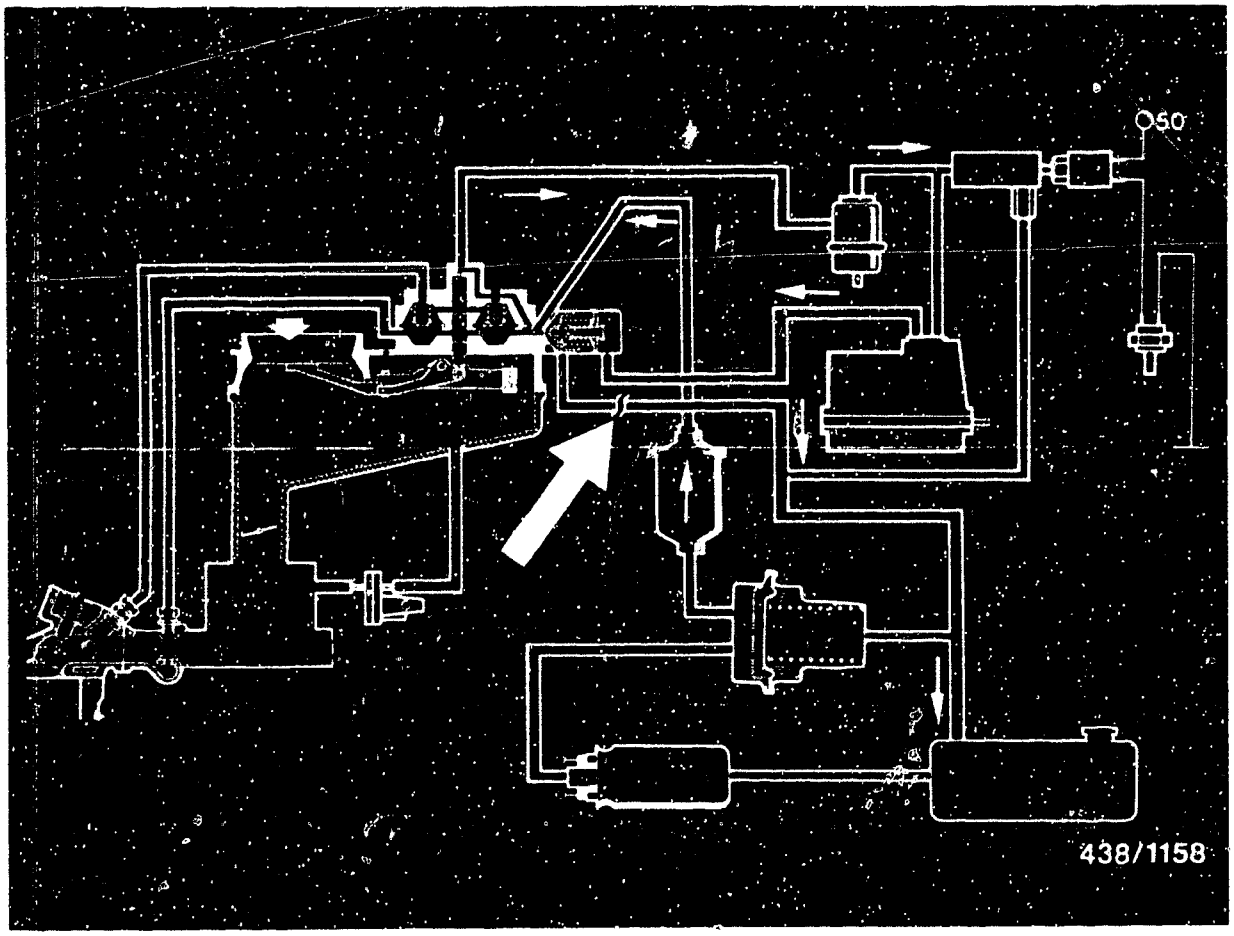
- By bridging the electrical safety circuit, supply power to the auxiliary-air device.
  After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.

- If the blocking plate does not close, check the power supply (open circuit, voltage drop).
  Minimum voltage across the connector 11.5 V with the engine stopped.

- If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohmmeter.

- Replace the auxiliary-air device if defective.

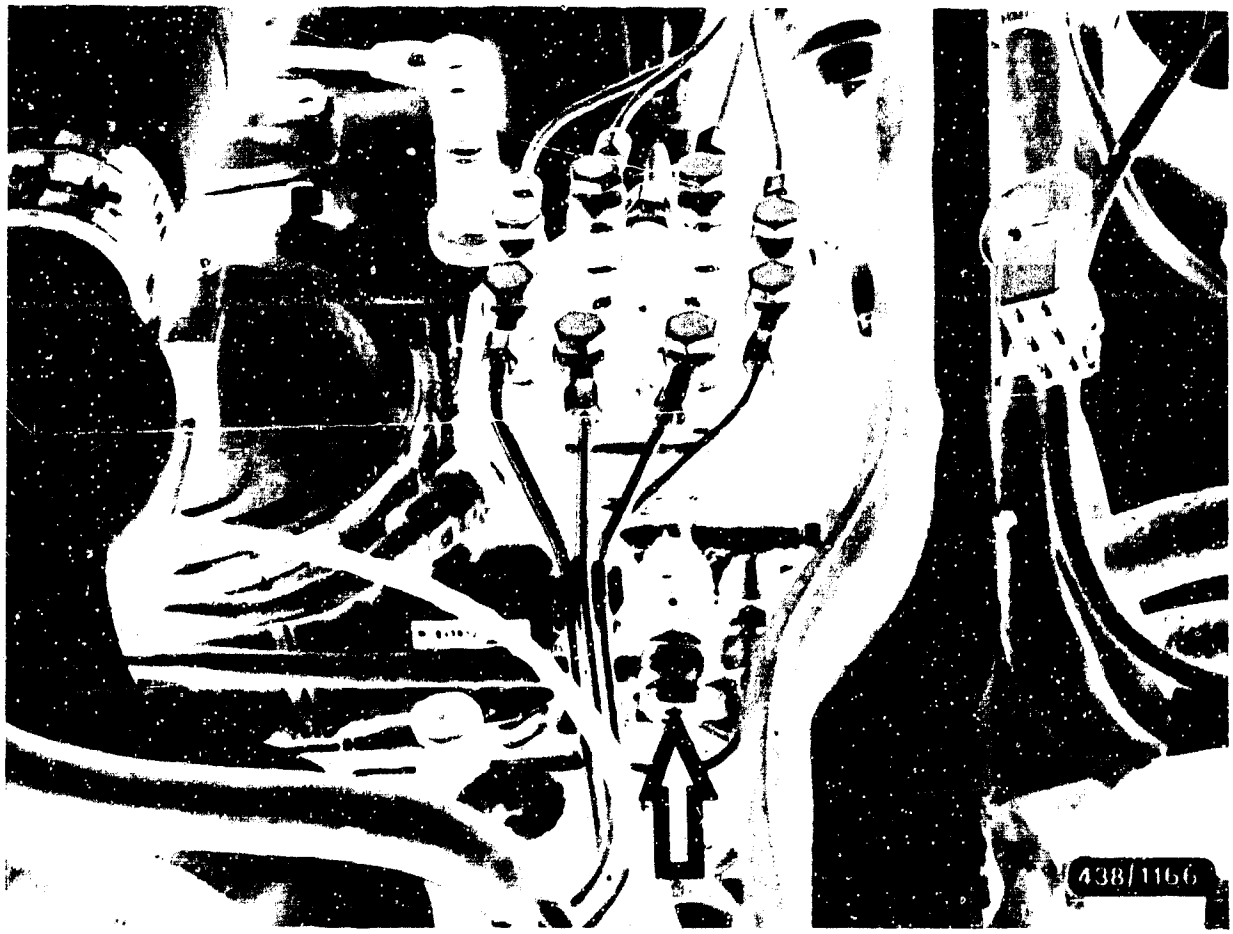
When the auxiliary-air device has been replaced, readjust the idle speed. The idle adjustment is described on Coordinate H 21.



12. Checking the operation of the electric fuel pump

12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i. e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



12.2. Measuring point:

A suitable measuring point is the return port on the fuel distributor (arrow). Unscrew the fuel return hose. Equip a test hose with an inlet union (dia. 12 mm) and connect to the return port of the fuel distributor.

Hold the end of the hose in a graduate (approx. 1.5 litre capacity) in order to make the measurement.

12.3 Checking:

Pull off the plug from the warm-up regulator and auxiliary-air device. Switch on the electric fuel pump for precisely 30 seconds by bridging the safety circuit and collect the fuel delivered in a graduate.

12.4 Test specification:

Fuel delivery:

1978 model with 2 electric fuel pumps: min. 1360 cm^3/30 s

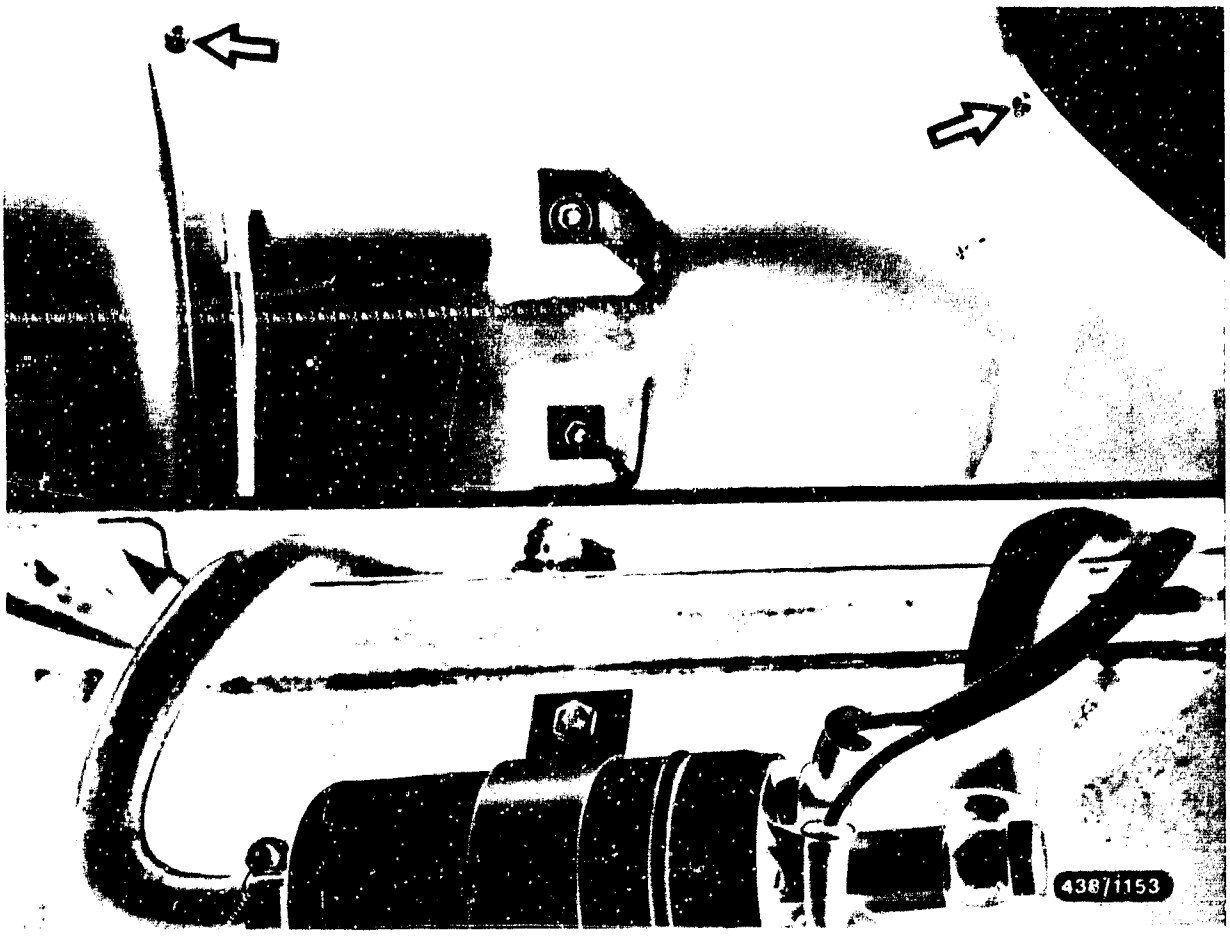
Models as of 1979 with 1 electric fuel pump: min. 1120 cm^3/30 s

12.5 Possible causes of insufficient fuel delivery as of 1979 model (one electric fuel pump):

- Power supply to the electric fuel pump defective, voltage drop. Necessary minimum voltage at terminal with pump operating = 11.5 V.

- Fuel filter very dirty.

If these points are O.K., the fault lies with the electric fuel pump itself.
Replace the electric fuel pump.

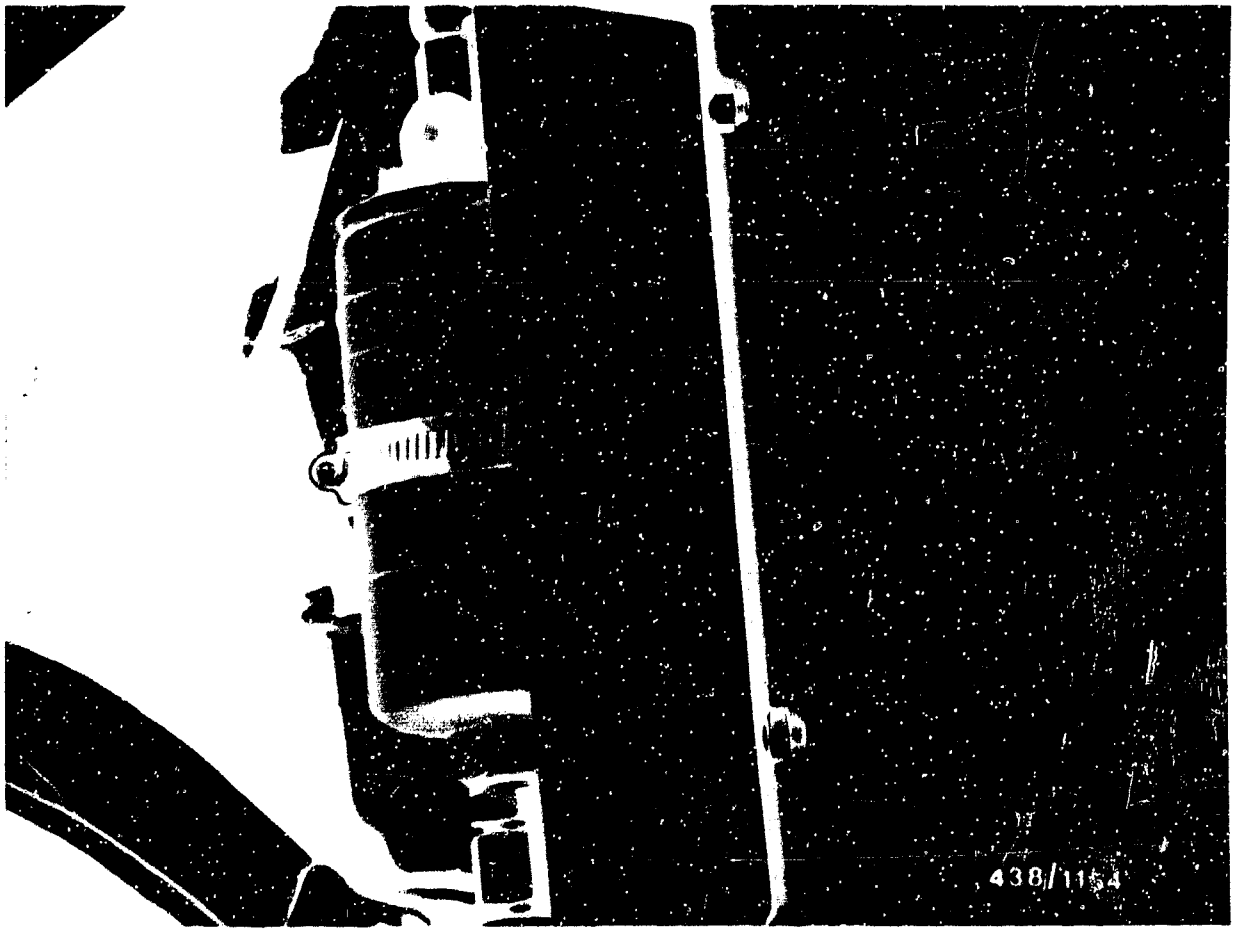


Installation position of electric fuel pump:

The electric fuel pump is mounted directly on the fuel tank on a mounting plate.

After loosening the upper fastening screws (arrows), it is possible to hinge down the mounting plate, thus making the pump accessible.

On the 1978 model (equipped with 2 electric fuel pumps) electric pump 1 is mounted in this position.



Electric fuel pump 2 on the 1978 model is under the right-hand rear fender near the fuel-tank filler neck.

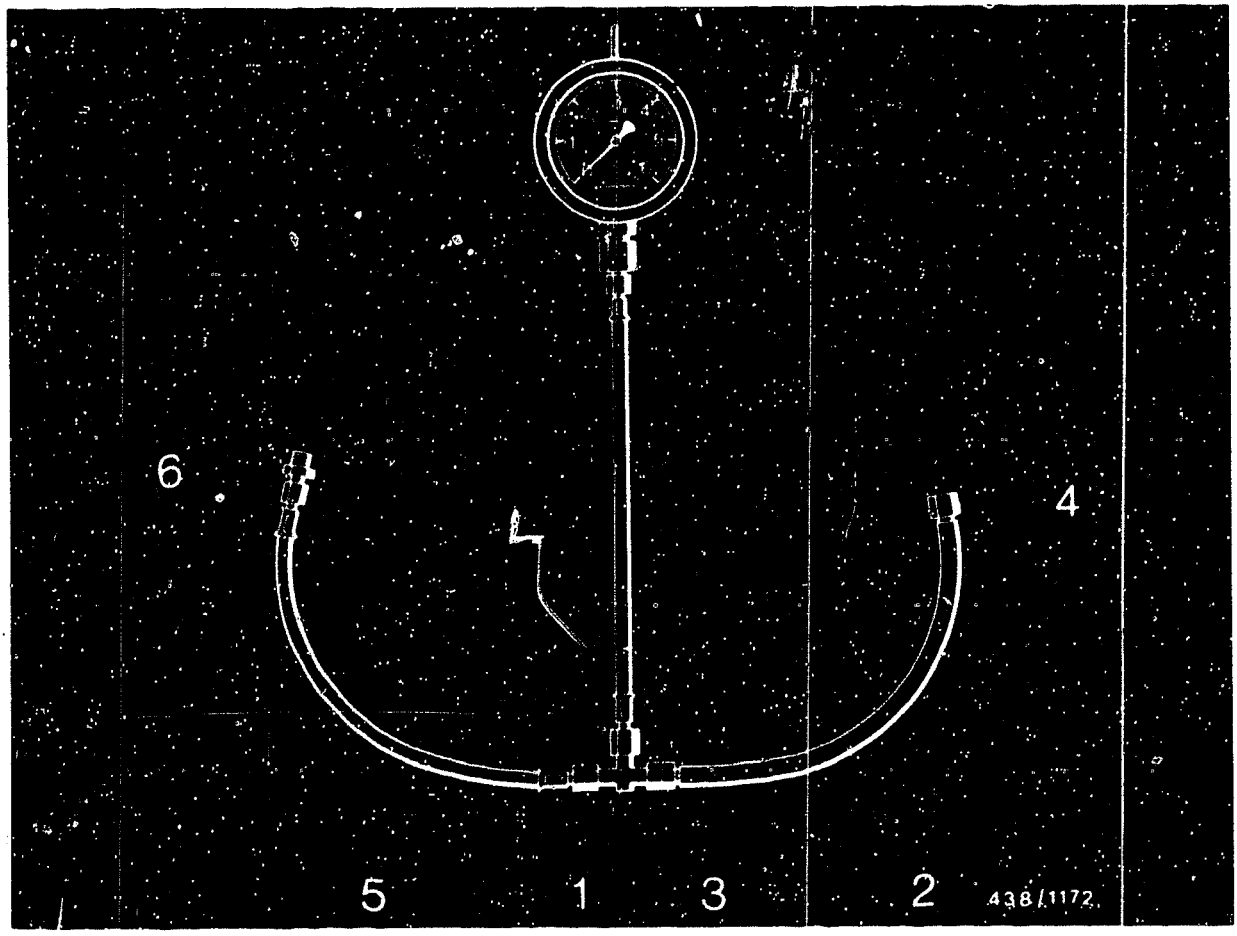
It is accessible from the wheel box after removing the dirt-deflector plate.

12.6 Special information for trouble-shooting on 1978 model (with 2 electric fuel pumps):

The test specification is the total delivery of both electric fuel pumps.

If fuel filter and power supply (minimum voltage at both electric fuel pumps 11.5 V) are O.K., establish by means of a pressure measurement between both pumps which pump is defective.

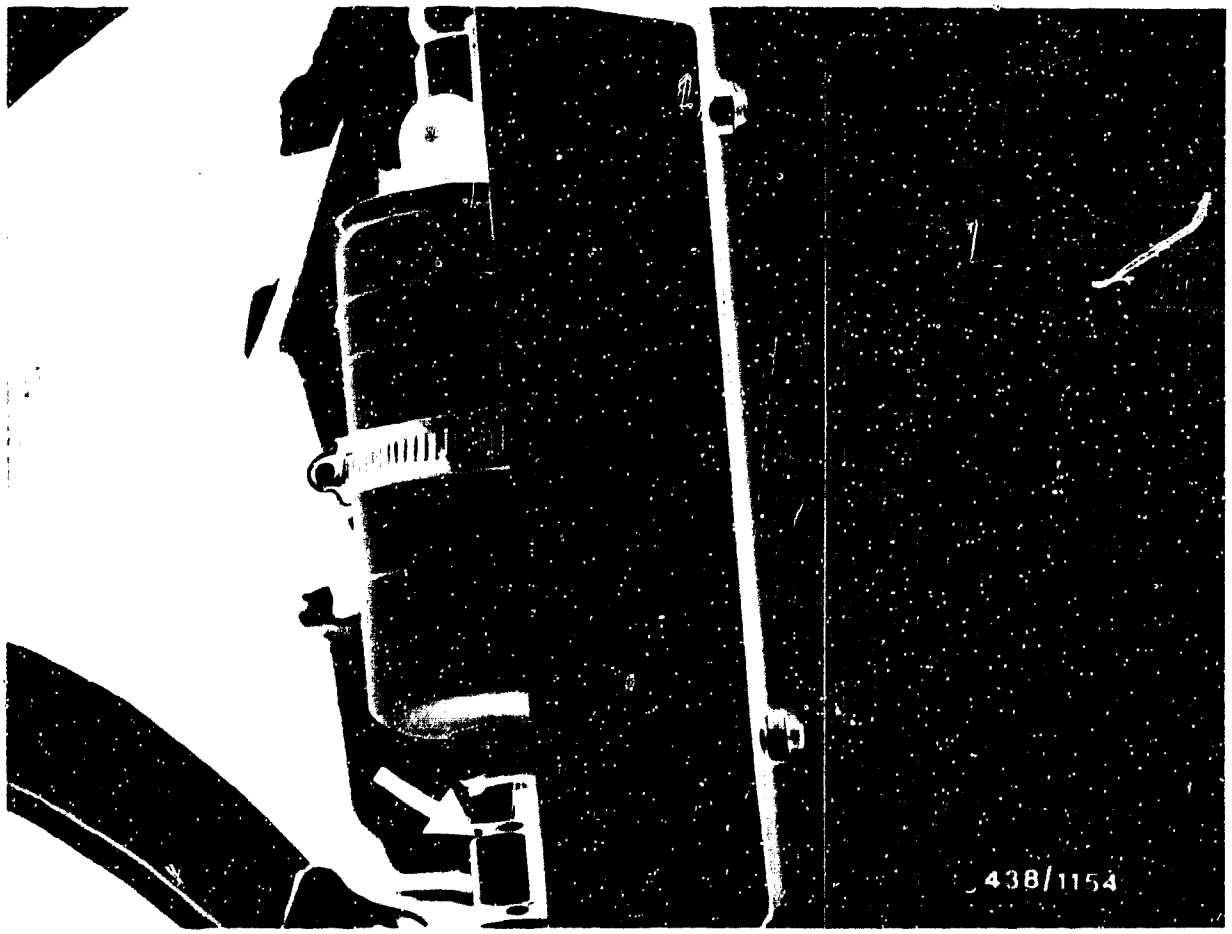
See the following coordinates.



A simple pressure tester as shown in the picture is required for the pressure measurement between the two electric fuel pumps.

It is advisable to convert the pressure tester KDJE-P 100 (previously KDEP 1034) as follows:

Replace the three-way valve by a commercially available T-connector (e.g. Ermeto) (1). Connect additional hose line (2) approx. 300 mm long, with ball connections and union nuts M 12 x 1.5 (3) and M 14 x 1.5 (4) to the T-piece. Connect double threaded fitting M 12 x 1.5/ M 14 x 1.5 (6) to the hose line (5).



Connect pressure tester to vehicle:

Unscrew fuel line from inlet port of electric fuel pump 2 (arrow). Catch any escaping fuel.

Connect pressure tester to fuel line and to inlet of electric fuel pump 2.

Pressure test:

Switch on electric fuel pumps by bridging the electrical safety circuit.
Pressure gauge must now indicate a pressure between 2 and 4 bar gauge pressure.

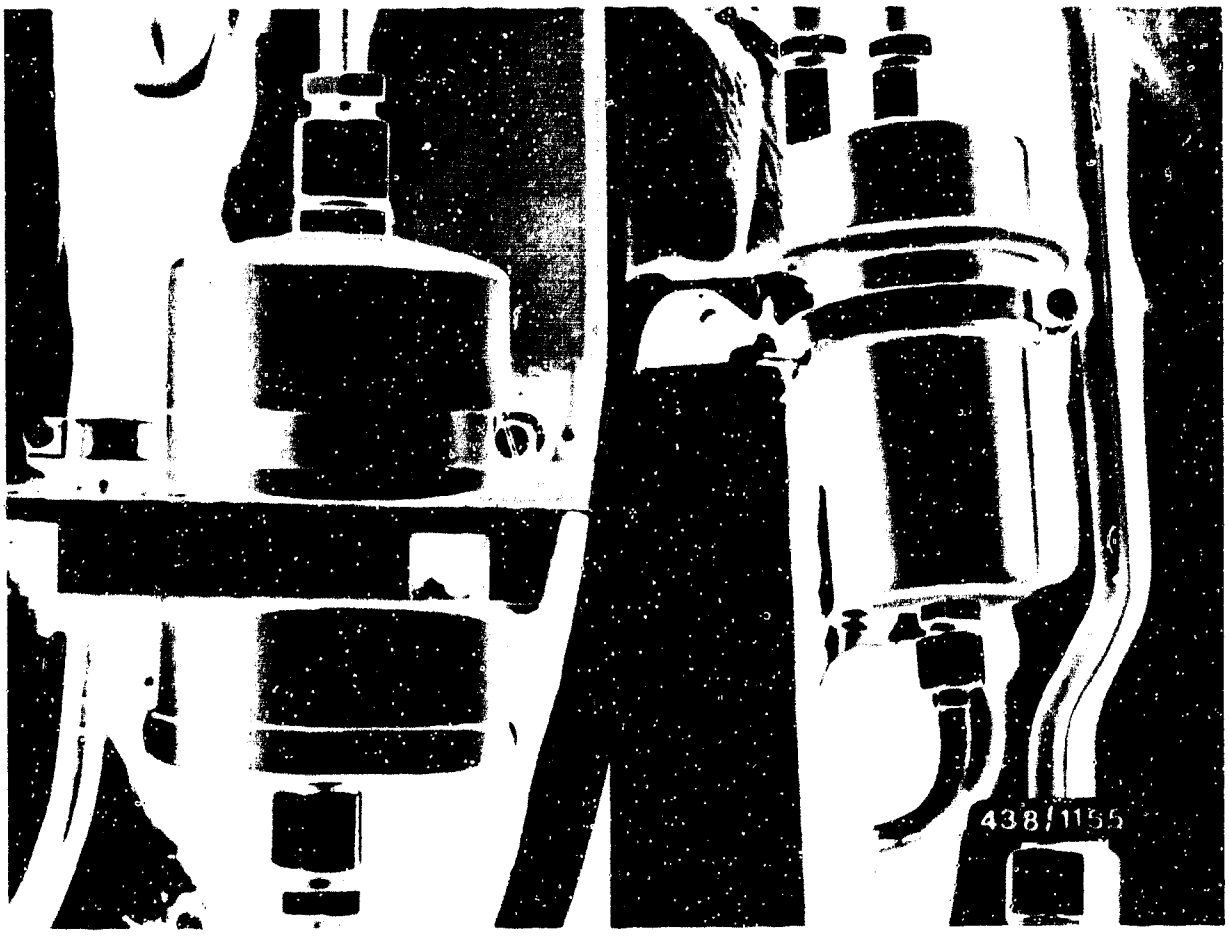
If the value is under 2 bar gauge pressure, electric fuel pump 1 is defective. In case of a pressure above 4 bar gauge pressure electric fuel pump 2 is defective.

Replace the appropriate electric fuel pump and repeat test.

12.7 Removing and installing the electric fuel pump(s):

Thoroughly clean all fuel line connections on the outside before loosening.
Before loosening, pinch off intake hose between fuel tank and electric fuel pump (electric fuel pump 1 on 1978 model) (e. g. using hose clamper W 157 from Matra Co.) so that no fuel escapes.

When installing, use new seal rings for the inlet-union screw of the pressure-side connection.



12.8 Removing and installing the fuel filter (left):

Unscrew the inlet-union screws of both fuel lines, applying counter-force to the fixed hexagonal section of the fuel filter.

Loosen the fastening clamp and pull out the filter.

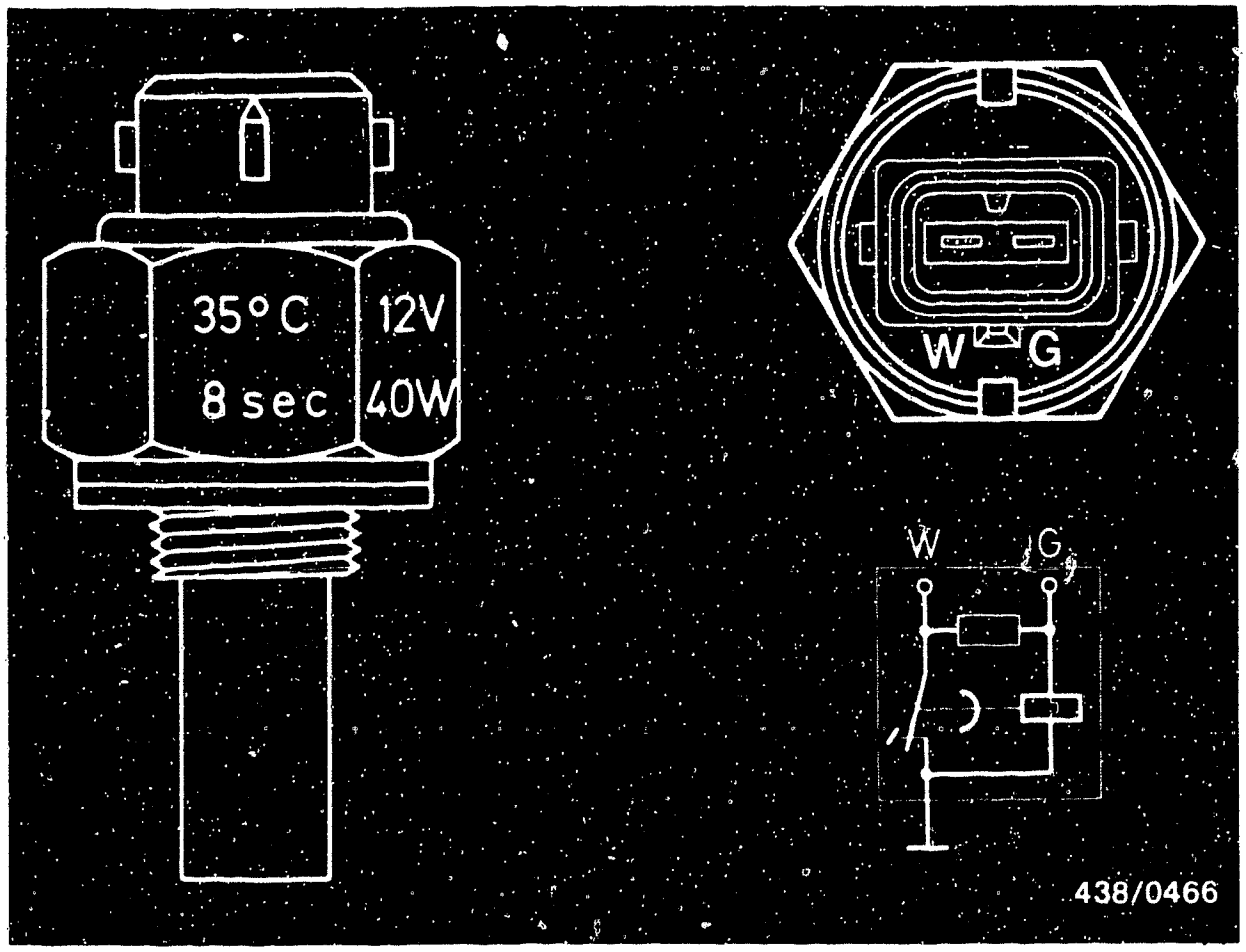
When installing, ensure the correct direction of flow and use new seal rings for the inlet-union screws.

13. Checking the cold-start system (thermo-time switch, start valve).

13.1 Thermo-time switch:

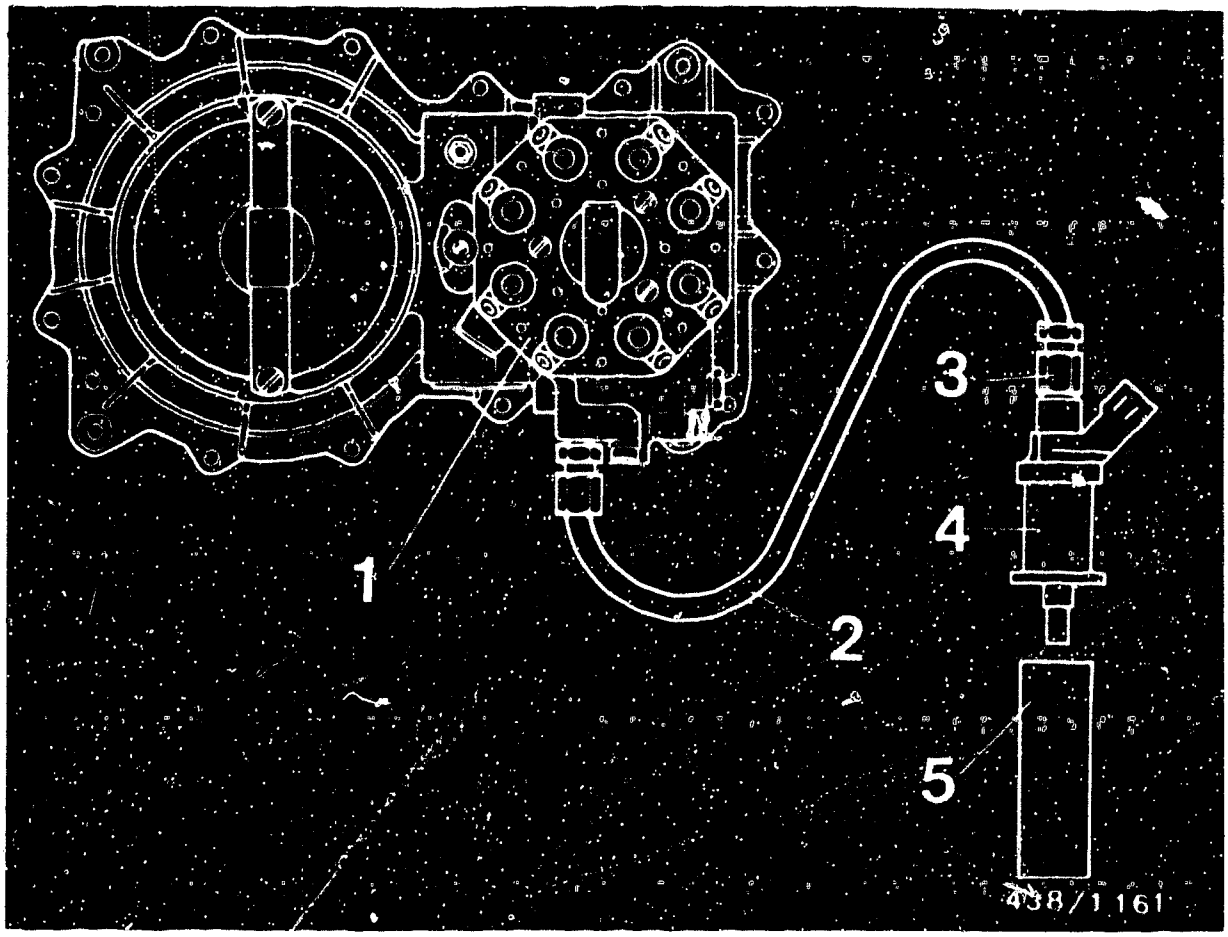
Remove the thermo-time switch for testing.

It is screwed into the housing of the coolant thermostat in the area behind the warm-up regulator. Remove if possible with the engine cold since some coolant will escape. The quantity escaping would be greater if the engine were warm.



The switching temperature +35°C and the switching time at -20°C of 8 seconds are stamped on the hexagonal section of the thermo-time switch.
The removed thermo-time switch is tested using the ohm-meter in accordance with the following values. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

at a temperature below °C	above °C	Resistance measurement between Term."G" and "ground" (housing)	Term."W" and "ground" (housing)	Term."G" and term. "W"
+30		25...40 Ω	0 Ω	25...40 Ω
	+40	50...80 Ω	100...160 Ω	50...80 Ω

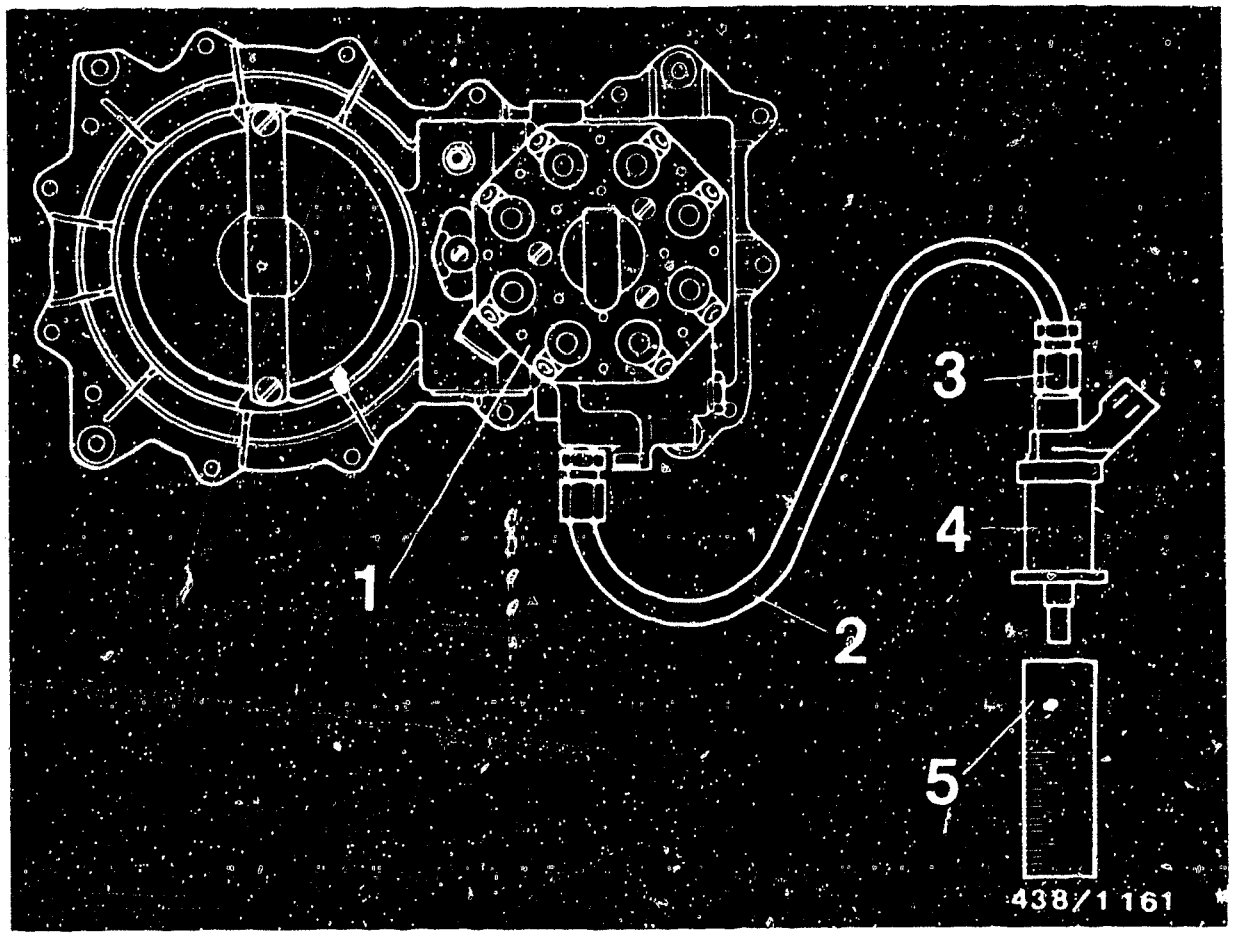


1 = Mixture-control unit
2 = Hose line from KDJE-P 100/11
3 = Threaded double fitting from KDJE-P 100/10
4 = Start valve
5 = Graduate

13.2 Start valve

Remove the start valve.

Unscrew fuel line to start valve on fuel distributor.



Using the hose line from the connecting-parts set KDJE-F 100/11 and the threaded double fitting M 12 x 1.5 /M 8 x 1 from connecting-parts set KDJE-P 100/10, connect the start valve directly to the start valve connection on the fuel distributor.

Hold start valve in a container (e.g. graduate) for testing.

With the aid of connecting cable KDJE 7450/70, connect start valve directly to ground and terminal 15 (e.g. input connection at ignition transformer ballast resistor 0.4 Ω).
Important: Do not hold connecting cable against B+. Danger of fire due to sparks.

Switch on the electric fuel pump by bridging the safety circuit.
Switch on ignition (max. 30 seconds). The start valve must open and squirt.

Switch off ignition. Remove electrical connecting cable and dry off the nozzle of the start valve. The safety circuit remains bridged so that primary pressure is applied to the start valve.

No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again. Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to perform the idle adjustment with the engine at normal operating temperature.
The idle adjustment is described on Coordinates H 21.

14. Checking the control pressures

14.1 Preliminary remarks:

The control pressures which are to be checked below are basically determined by the warm-up regulator.
If the measurement result is incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

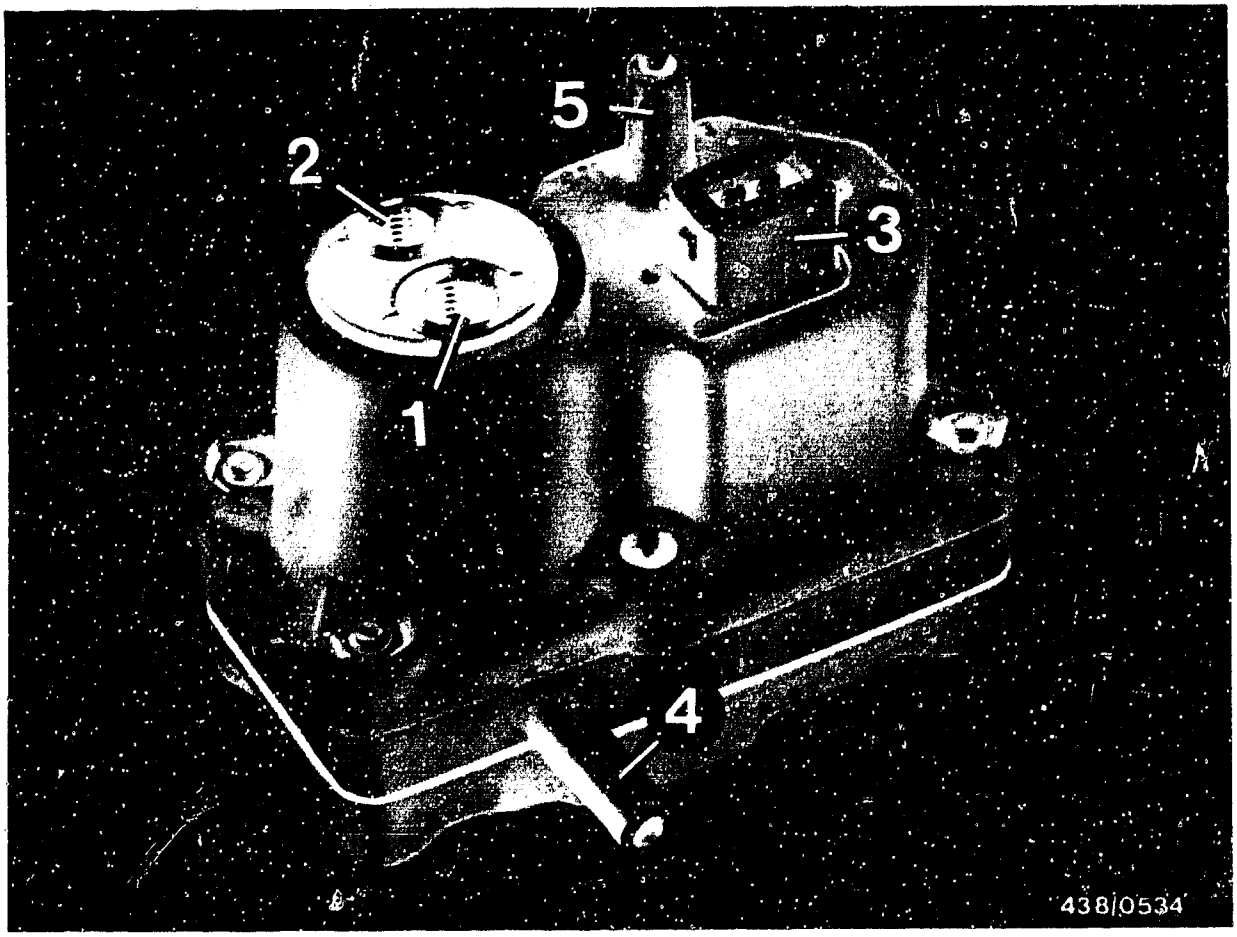
These possible faults are:

- No voltage across the electrical connector or voltage too low
- Fuel return from warm-up regulator blocked or constricted.
- Fuel delivery for control-pressure circuit too low or too high.
- Control-pressure-reduction valve leaking (concerns only vehicles as of 1981 model year or earlier model years if control-pressure-reduction valve has been retrofitted).

The testing of this control-pressure delivery is described at the beginning of the control-pressure checks as an additional test step.

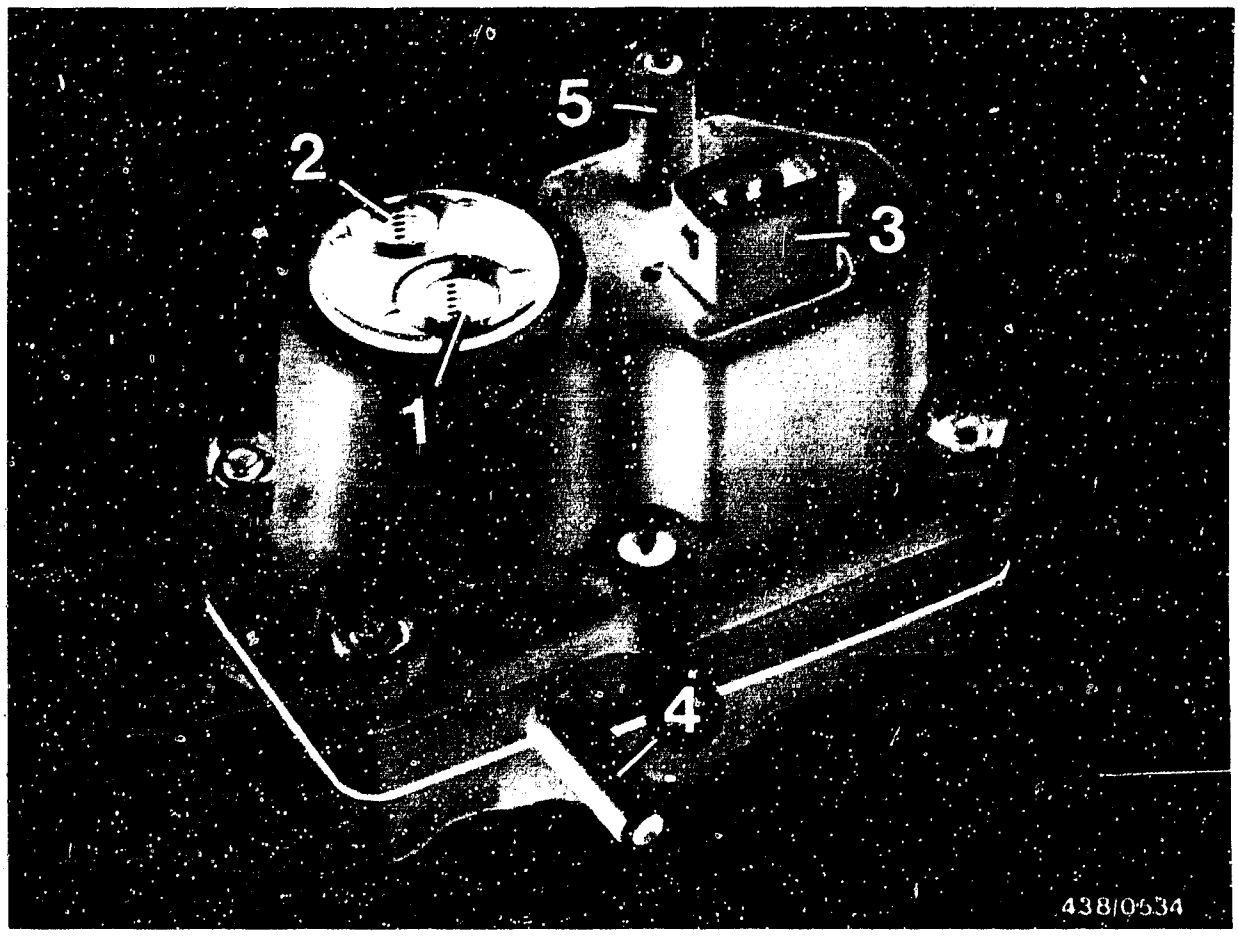
Test specification: 160 ... 240 cm^3/min

Reference is made to the other possible causes of trouble in the respective test step.



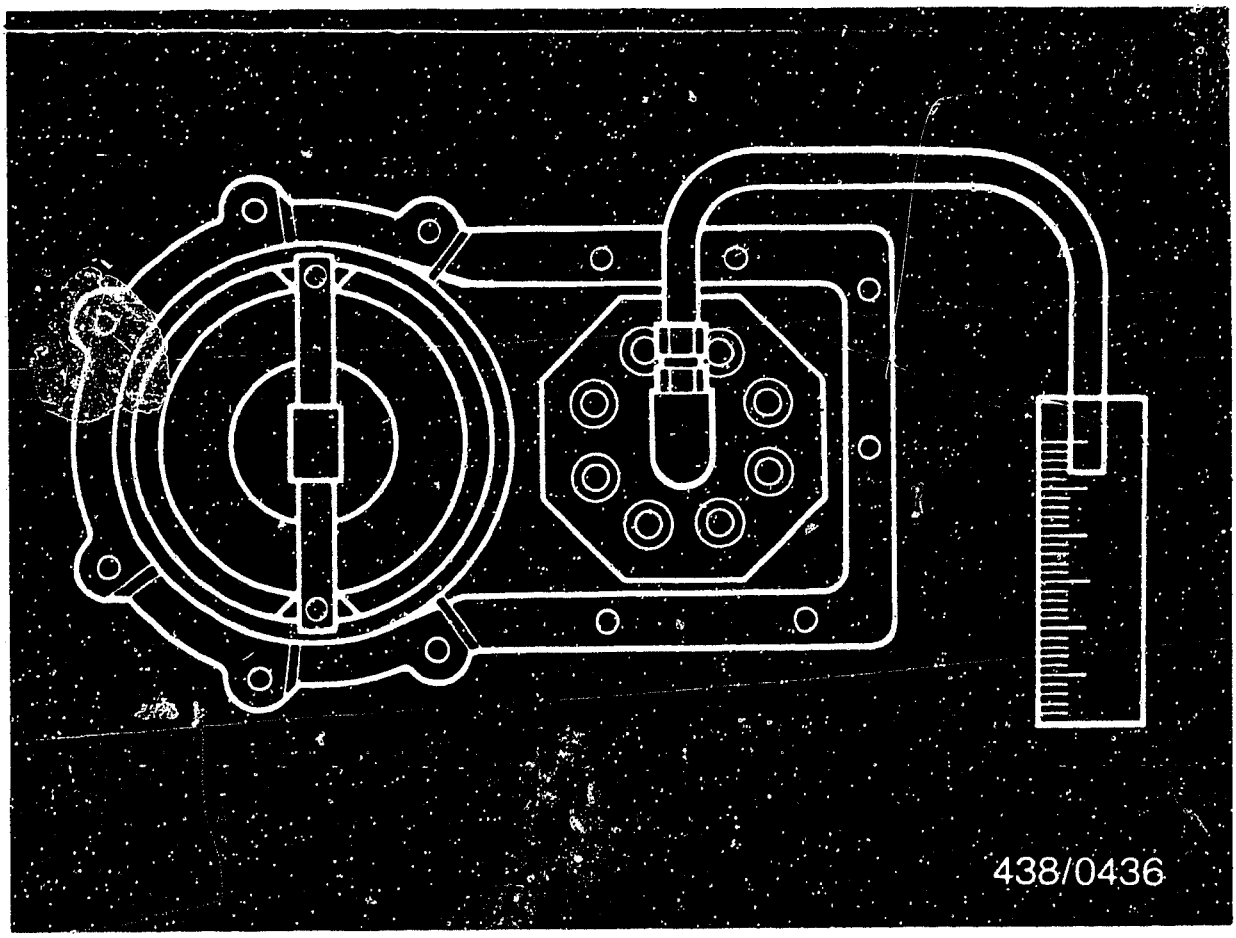
1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and throttle valve).

Warm-up regulator version (in vehicles as of 81 model)
0 438 140 036, 053, 063,
086, 087
The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment. This means that the cold and warm control pressures are additionally influenced by the intake-manifold pressure acting on the full-load diaphragm of the warm-up regulator.



1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and throttle valve).

The intake-manifold-pressure connection port (4) is located on the intermediate plate. On the top of the housing cover there is a connection pipe for atmospheric pressure (connection to the engine before the throttle valve).



14.3 Checking the fuel delivery for the control-pressure circuit

Before testing, make sure that the electric fuel pump is operating properly.

Test specification

1978 model with 2 electric fuel pumps:	min. 1360 cm^3/30 s
Model as of 1979:	min. 1120 cm^3/30 s

Unscrew control-pressure line (to warm-up regulator) on fuel distributor.

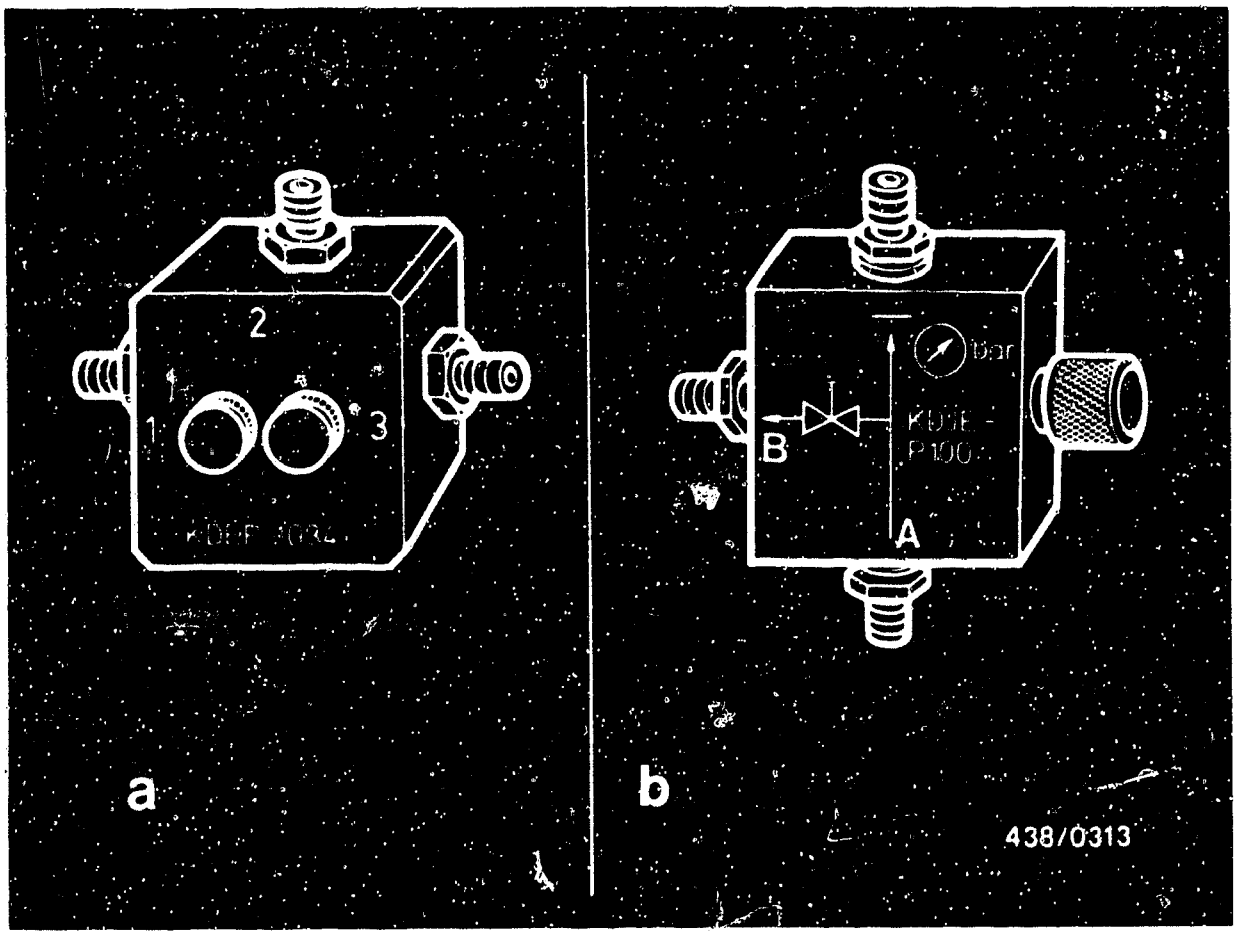
Connect the connecting hose KDJE-P 100/11/1 (formerly KDEP 1034/11/1) of the pressure tester to the control-pressure port of the fuel distributor and hold hose in graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

Test specification: 160...240 cm^3/min.

If the measured value is outside tolerance, the fault is in the fuel distributor.

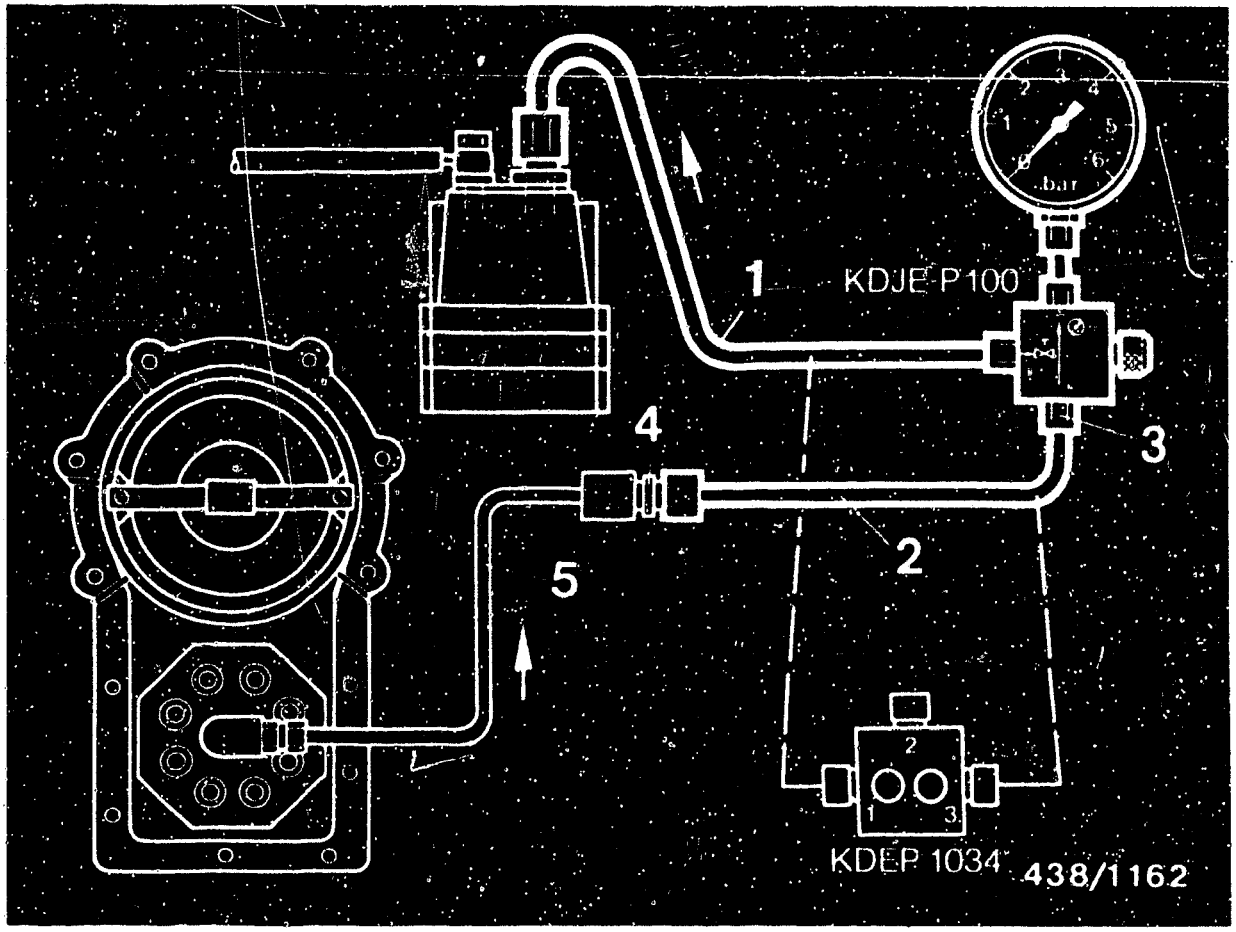
Replace the fuel distributor.



14.4 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a). Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:
A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

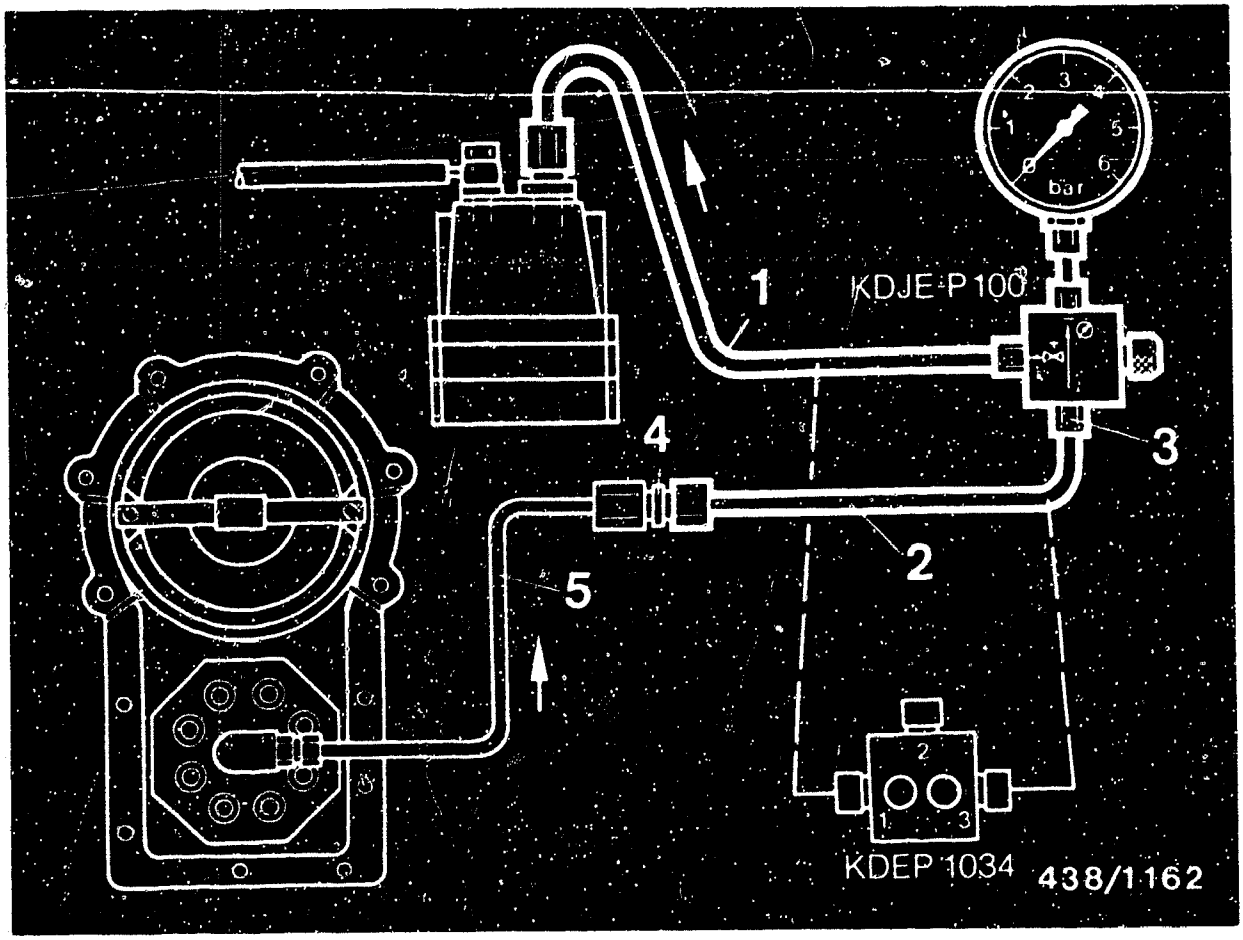
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator on the side of the warm-up regulator.

Mount using connecting-parts set KDJE-P 100/11.

Unscrew control-pressure line (with union nut) on warm-up regulator. Connect hose line from connecting-parts set KDJE-P 100/11 to the warm-up regulator inlet and to directional-control valve, connection B (1).

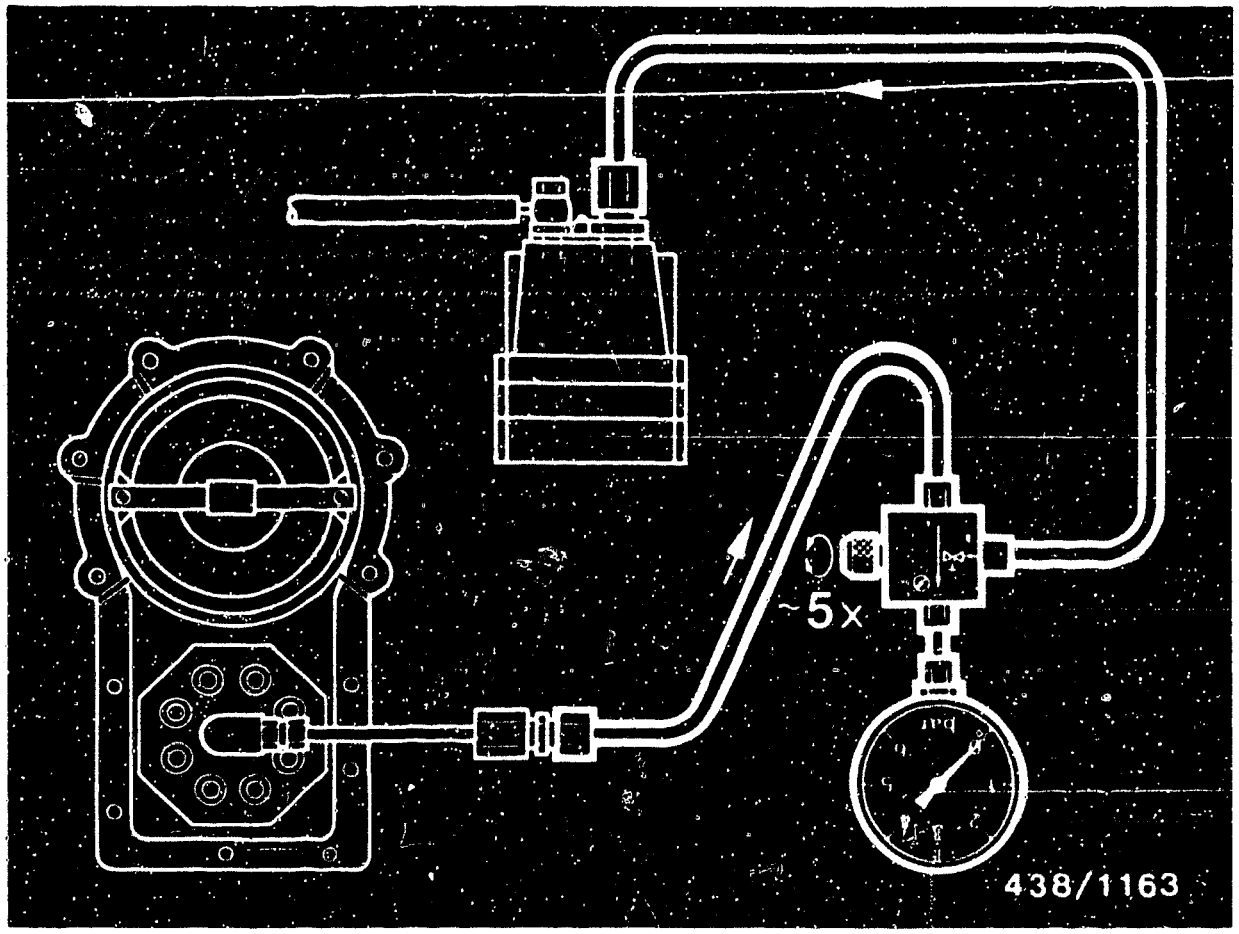


Connect hose line (2) of pressure tester to connection A of directional-control valve (3).

Connect hose line to control-pressure line (5) by means of threaded double fitting (4) of connecting-parts set.

The steel control-pressure line must not be kinked or bent.

Suspend pressure gauge from engine hood.



14.5 Bleeding the pressure tester

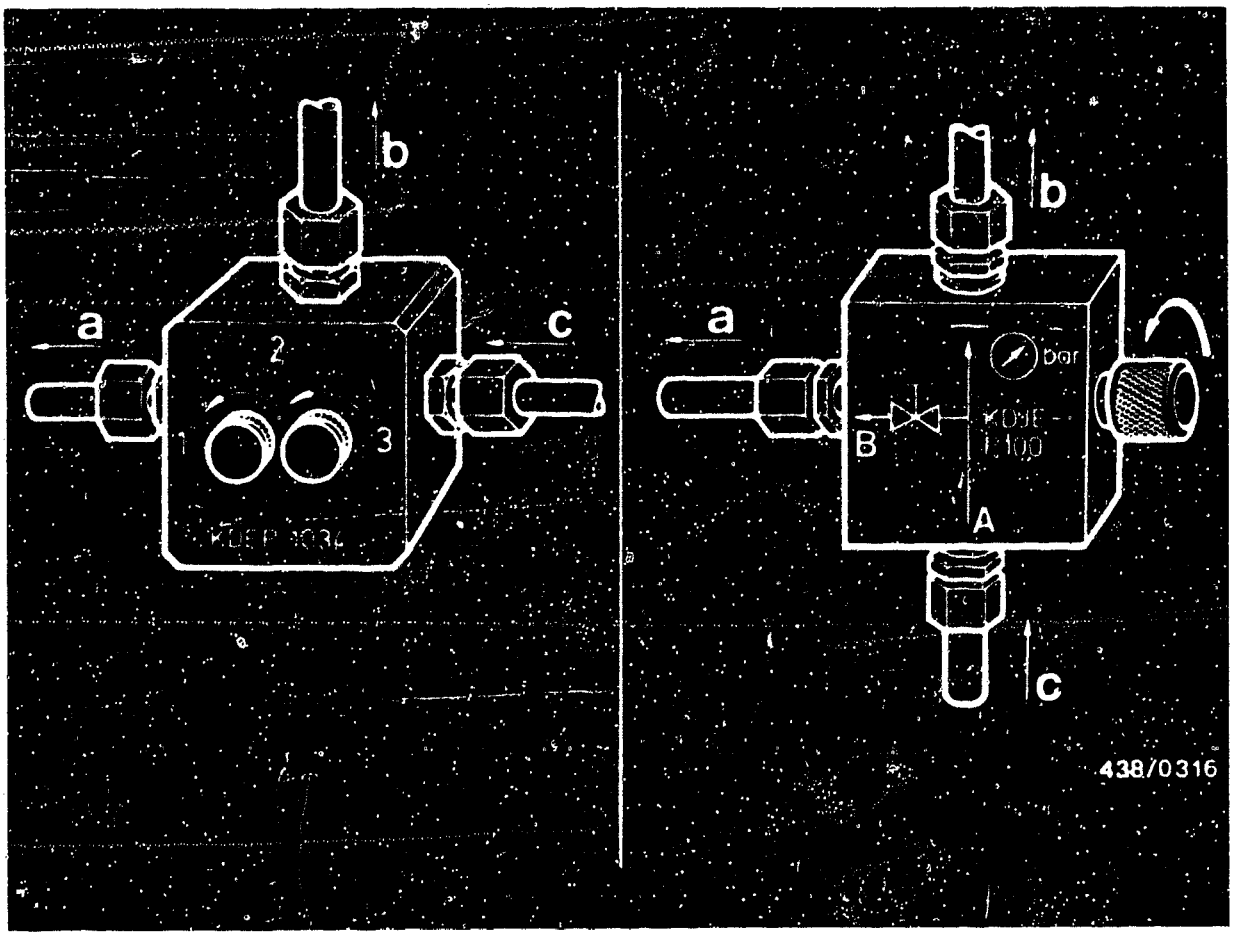
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

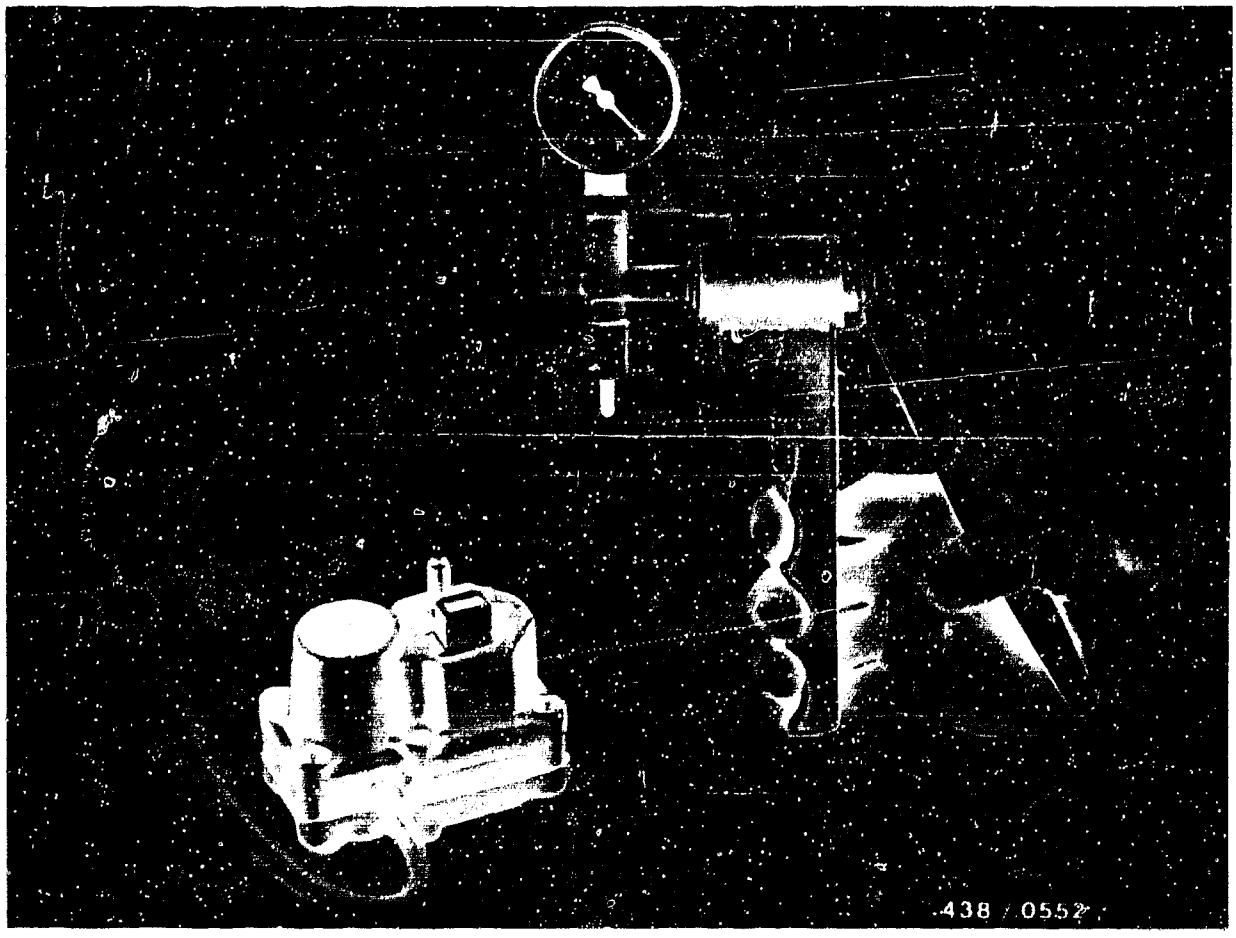
Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.6 Testing the "cold" control pressure:

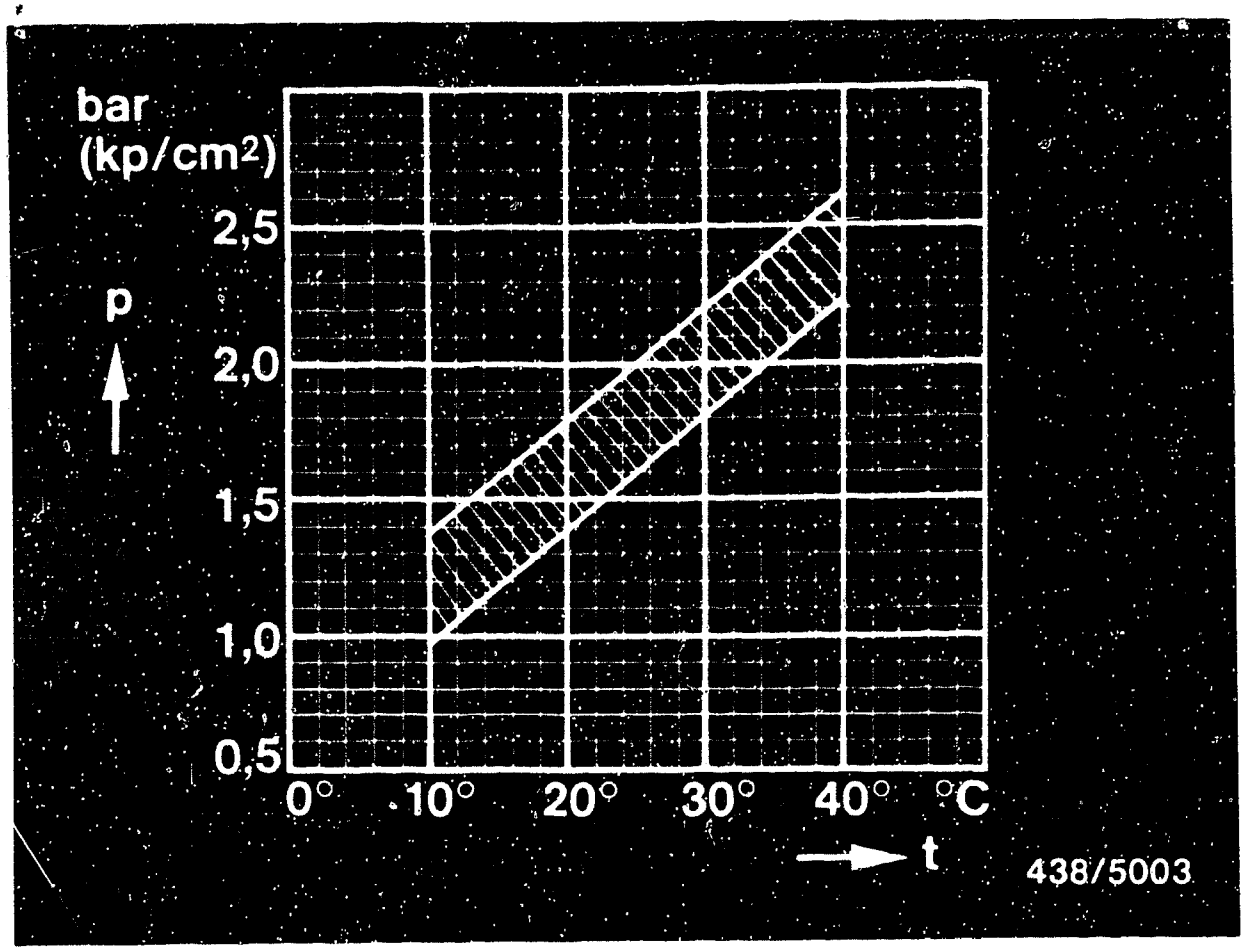
The test is performed with the engine switched off.
The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.
Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.



The control pressure is checked with simulated intake-manifold pressure, i.e. vacuum is applied to the warm-up regulator.
To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the intermediate plate of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.

Setting value for testing: 450...550 mbar
(340...420 mmHg)

The "cold" control pressure is indicated on the pressure gauge of the pressure tester.



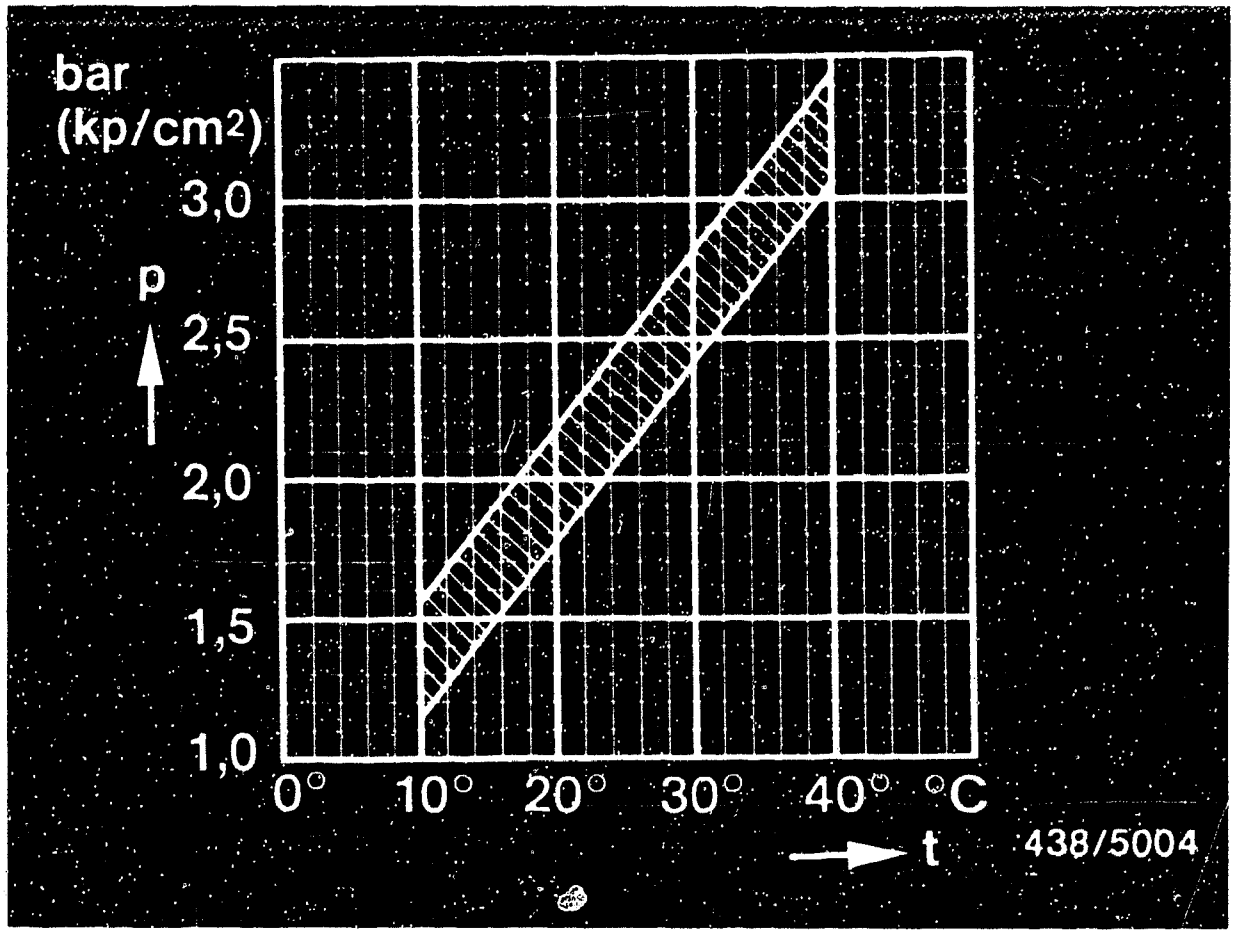
p = Control pressure
t = Ambient temperature

Control pressure "cold"

(Warm-up regulator part no. 0 438 140 036
086)

For testing, connect vacuum pump to intake-manifold pressure connection of warm-up regulator.

Setting value: 450 ... 550 mbar
340 ... 420 mmHg)



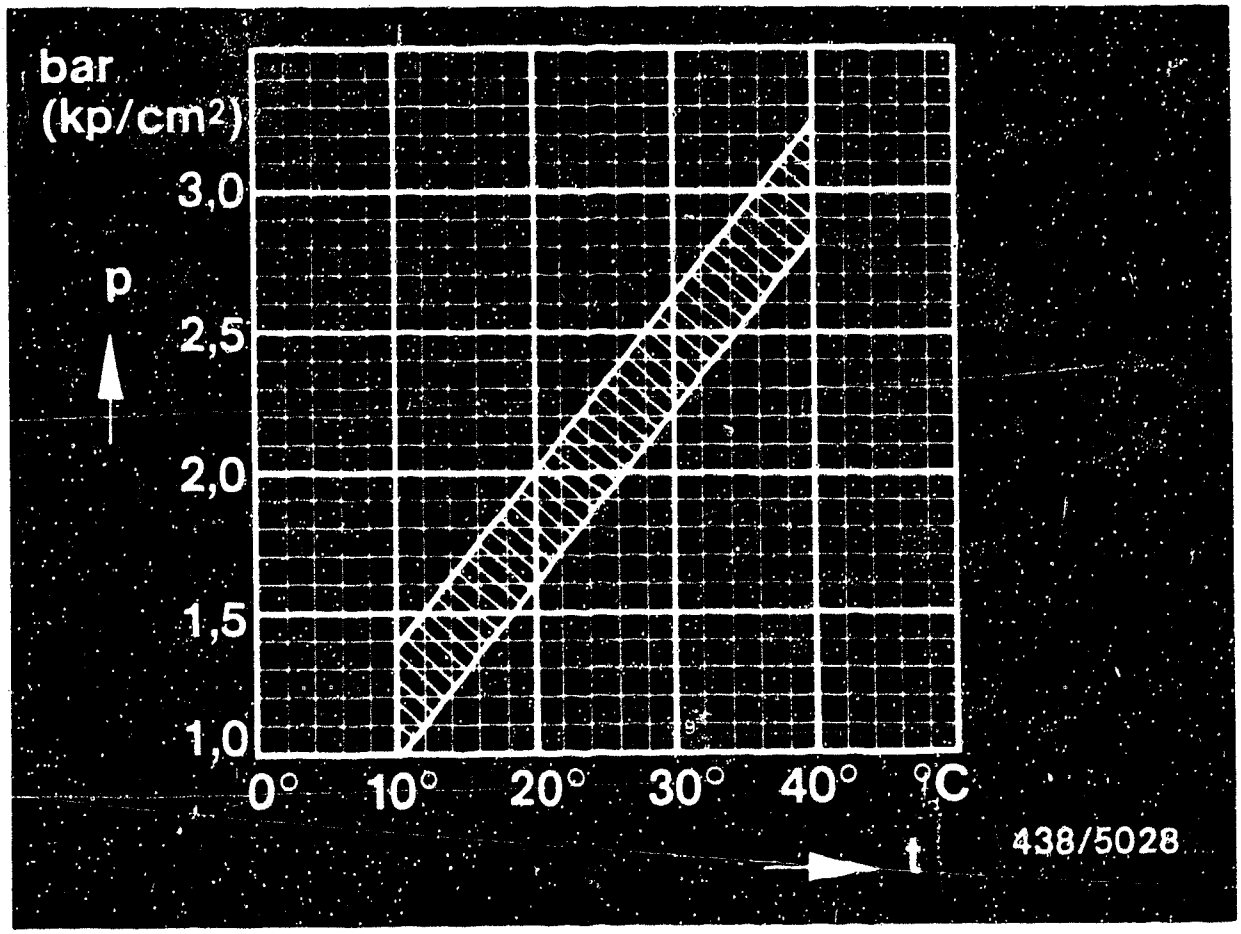
p = Control pressure
t = Ambient temperature

1.2 Control pressure "cold"

(Part No. of warm-up regulator: 0 438 140 063)

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 450...550 mbar
(340...420 mmHg)



p = Control pressure
t = Ambient temperature

1.2 Control pressure "cold"

(Part No. of warm-up regulator: 0 438 140 053/087)

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 450...550 mbar
(340...420 mmHg)

If the measured "cold" control pressure differs from the set value, this may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery.
  Test specification: 160 ... 240 cm^3/min.

- Fuel return from warm-up regulator blocked or constricted (if control pressure too high).
  Eliminate constriction.

- Control-pressure-reduction valve leaking (concerns only vehicles as of 1981 model year or earlier model years if control-pressure-reduction valve has been retrofitted).

- Warm-up regulator defective. Replace warm-up regulator.

  Note: New versions of warm-up regulator for vehicles of earlier model years:

  To improve the warm-up performance of the 928/928 S models, warm-up regulators with a modified characteristic have been installed since the 1981 model year.

  Warm-up regulator part numbers:

  928: 0 438 140 087
  928 S: 0 438 140 086

  These warm-up regulators are equipped with two separate heating resistors whereby one heating resistor is energized by a thermo-contact.

Operation:

At temperatures below 15°C the thermo-contact is open. After the engine has started in this temperature range, therefore, initially only one heating resistor is switched on, as a result of which the shutoff process is delayed.

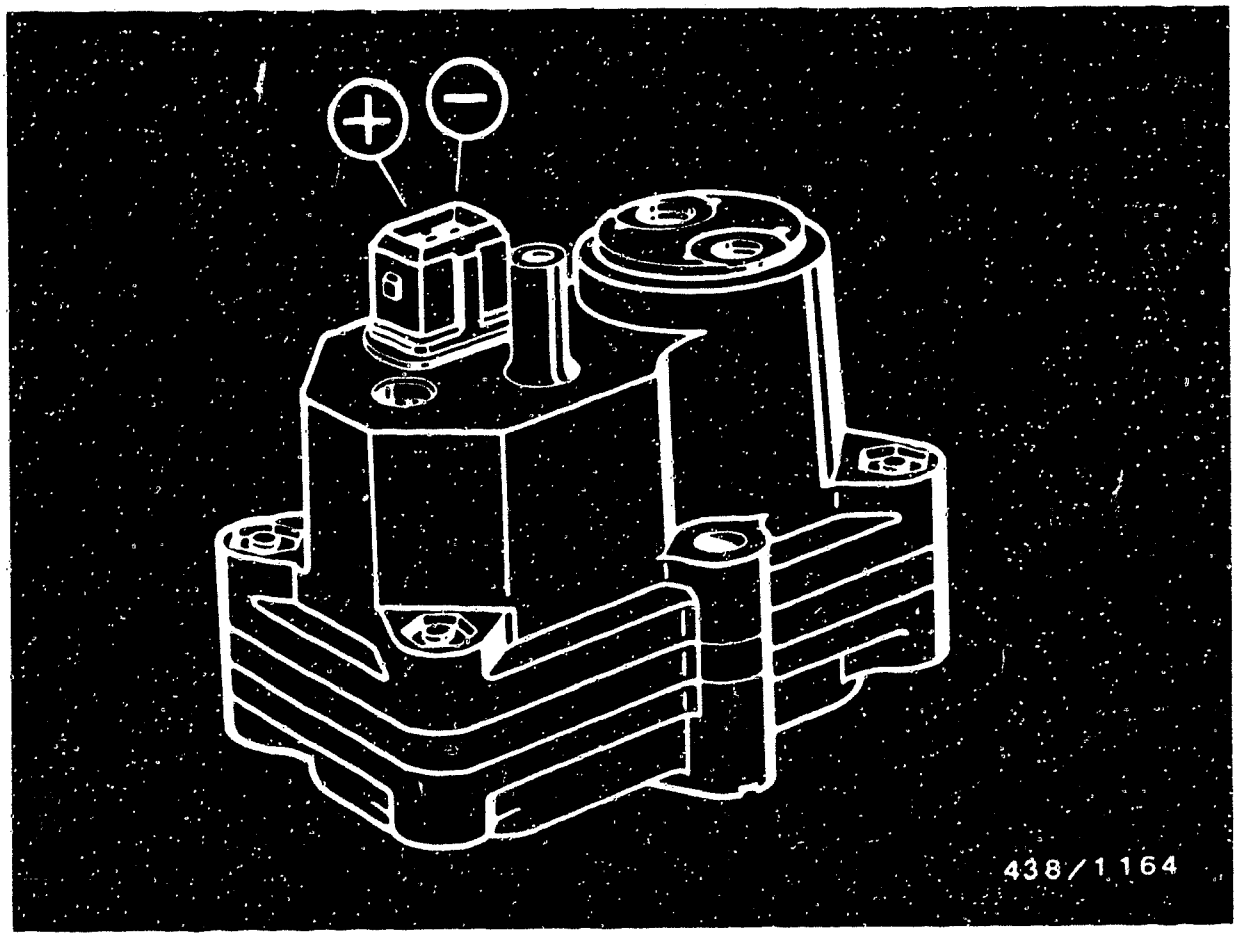
When the temperature exceeds 15°C, either as a result of higher ambient temperature or due to the heating resistor which is already switched on, the thermo-contact closes and connects in the second heating resistor. Both heating resistors are connected in parallel. Due to the thus increased heating effect, therefore, the shutoff function of the warm-up regulator is accelerated at temperatures above 15°C.

Porsche has recommended its own service organization in future to install only the above-mentioned 1981 model year warm-up regulator even in earlier vehicles (1978... 1980 model), should there be a complaint.

We endorse this recommendation for the Bosch After-Sales Service Organization.

In this connection, be sure to observe the following:

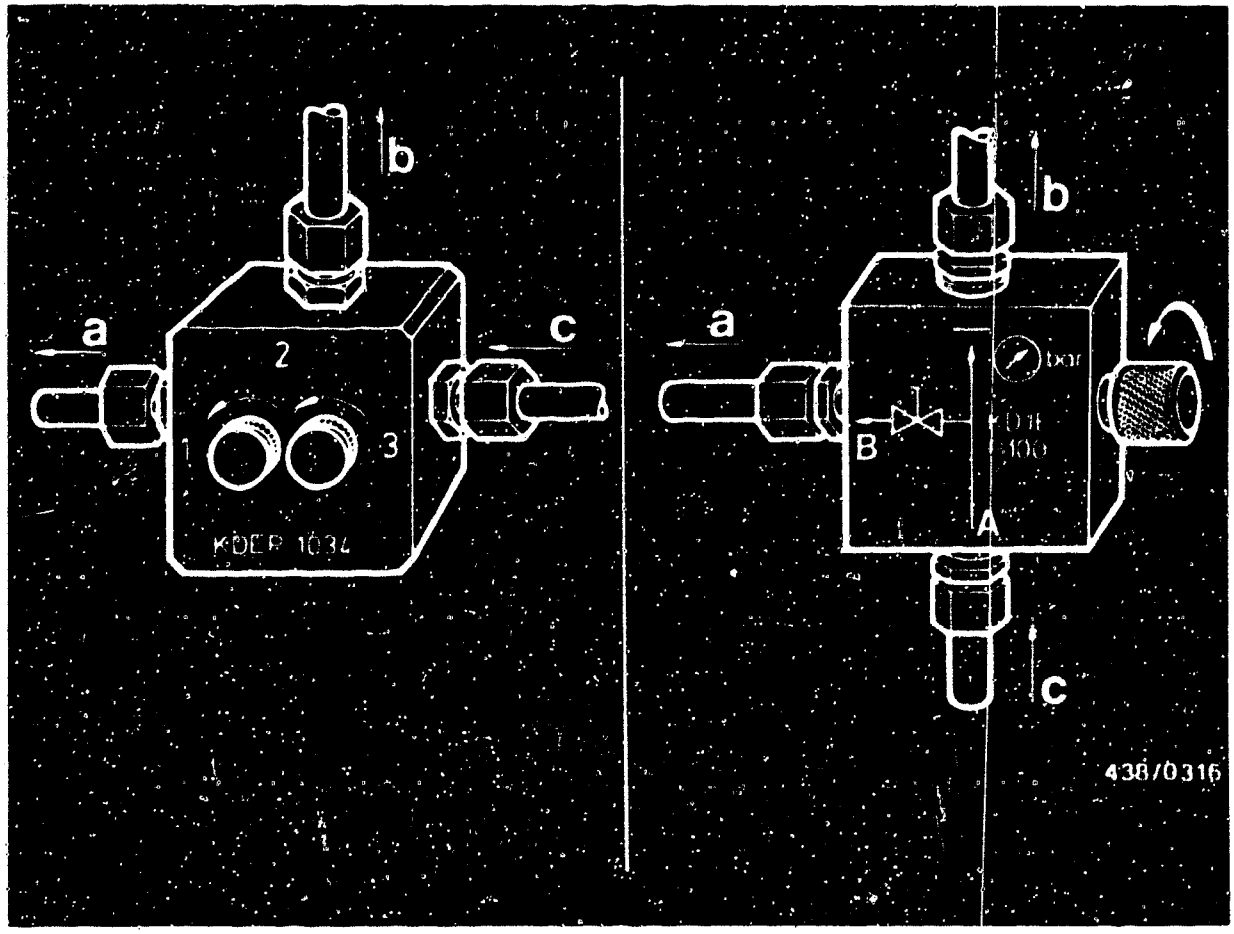
In the case of warm-up regulators with thermo-contact, the correct polarity of the electrical connector must be ensured. In the case of incorrect connection, the thermo-contact will be destroyed.



In the 928/928 S vehicles of model years 1978 to 1980 the correct polarity is not specified. Therefore, when installing the new warm-up regulators, this must be tested and, if necessary, rectified on the connector (+ to +, - to -).

When the warm-up regulator has been replaced or a fault remedied, it is necessary finally to carry out the idle adjustment with the engine at normal operating temperature.

The idle adjustment is described on Coordinate H 21.



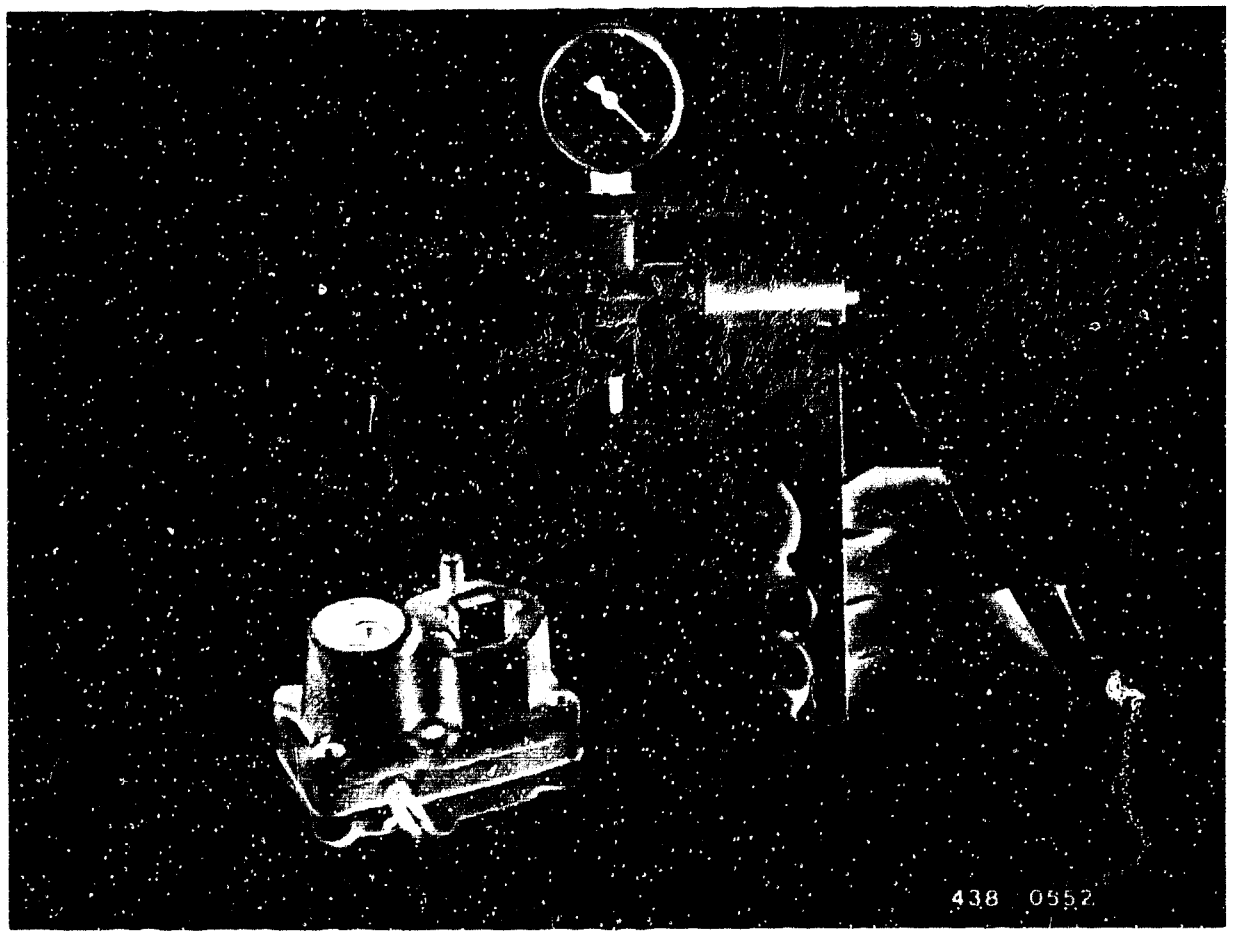
a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.7 Checking the "warm" control pressure

Warm-up regulator Part No.:
0 438 140 036,053,063,086,087

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied.

Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).



For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (in the intermediate plate of the housing).

The picture shows the recommended Mityvac hand pump.

Setting value for the test: 450...550 mbar
(340...420 mmHg)

Test Procedure:

Engine temperature unimportant.

Open valve screw of directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Connect plug to warm-up regulator.

Control pressure now rises (warm-up regulator in the process of shutting off) until "warm" control pressure is reached.

Test first of all without application of intake-manifold pressure, then with simulated manifold pressure (vacuum) according to the following values:

"Warm" Control Pressure

Warm-up regulator part numbers:	0 438 140 036
	053
	063
	086
	087

- Test without charge-air pressure:
  3.4 ... 3.8 bar (3.5 ... 3.9 kgf/cm²)

- Test with simulated charge-air pressure (gauge pressure):
  450 ... 550 mbar
  (340 ... 420 mmHg): 2.8 ... 3.2 bar (2.9 ... 3.3 kgf/cm²)

- Leak test on full-load diaphragm:
  Test pressure: 600 mbar (450 mmHg)
  Max. pressure drop: 66 mbar (50 mmHg)/15 s

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for control-pressure circuit too high.
  Test fuel delivery.
  Test specification: 160 ... 240 cm^3/min

- Fuel return from warm-up regulator blocked or constricted. Eliminate constriction.

- Warm-up regulator hydraulically defective.
  Replace warm-up regulator.

If the warm-up regulator has failed due to fouling, the new warm-up regulator should be provided with tube fitting 1 433 356 802. Tightening torque 20 ... 22 Nm (2.0 ... 2.2 kgfm).

If control pressure too low:

- Open circuit in power supply.
  Eliminate open circuit. Ensure proper contacting at plug.

- Battery voltage too low, voltage drop. Eliminate voltage drop. Minimum voltage across plug: 11.5 V. If necessary, repeat test with engine running in order to obtain the generator voltage of approx. 14 V normal during vehicle operation.

- Fuel delivery for control-pressure circuit too low. Test fuel delivery.
  Test specification 160 ... 240 cm^3/min.

- Warm-up regulator defective. Open circuit in heating coil. Hydraulic defect. Replace warm-up regulator.

- Control-pressure-reduction valve leaking (concerns only vehicles as of 1981 model year or earlier model years if control-pressure-reduction valve has been retrofitted).

Note: New versions of warm-up regulator for vehicles of earlier model years:

To improve the warm-up performance of the 928/928 S models, warm-up regulators with a modified characteristic have been installed since the 1981 model year:

Warm-up regulator part numbers:

928: 0 438 140 087
928 S: 0 438 140 086

These warm-up regulators are equipped with two separate heating resistors whereby one heating resistor is energized by a thermo-contact.

Operation:

At temperatures below 15°C the thermo-contact is open. After the engine has started in this temperature range, therefore, initially only one heating resistor is switched on, as a result of which the shutoff process is delayed.

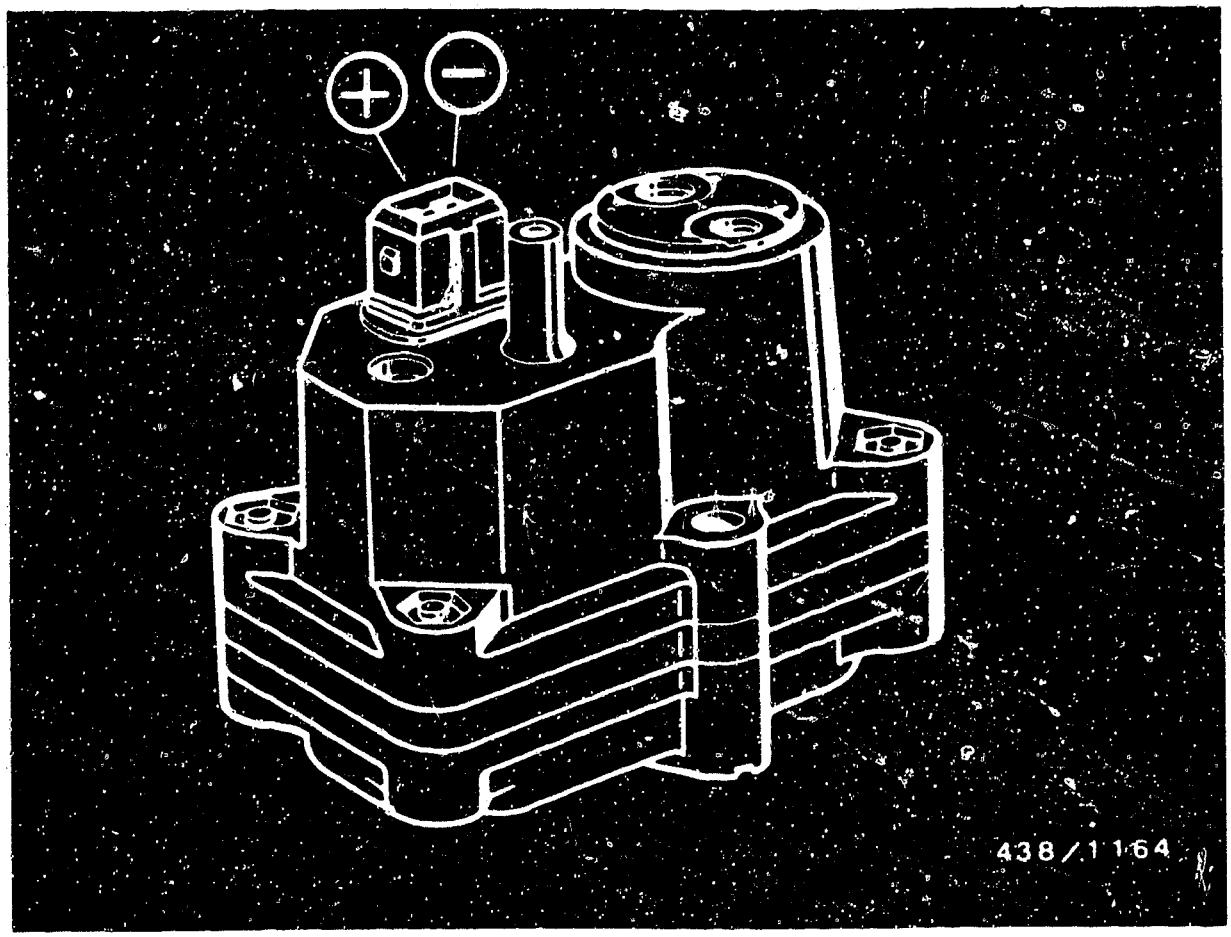
When the temperature exceeds 15°C, either as a result of higher ambient temperature or due to the heating resistor which is already switched on, the thermo-contact closes and connects in the second heating resistor. Both heating resistors are connected in parallel. Due to the thus increased heating effect, therefore, the shutoff function of the warm-up regulator is accelerated at temperatures above 15°C.

Porsche has recommended its own service organization in future to install only the above-mentioned 1981 model year warm-up regulator even in earlier vehicles (1978... 1980 model), should there be a complaint.

We endorse this recommendation for the Bosch After-Sales Service Organization.

In this connection, be sure to observe the following:

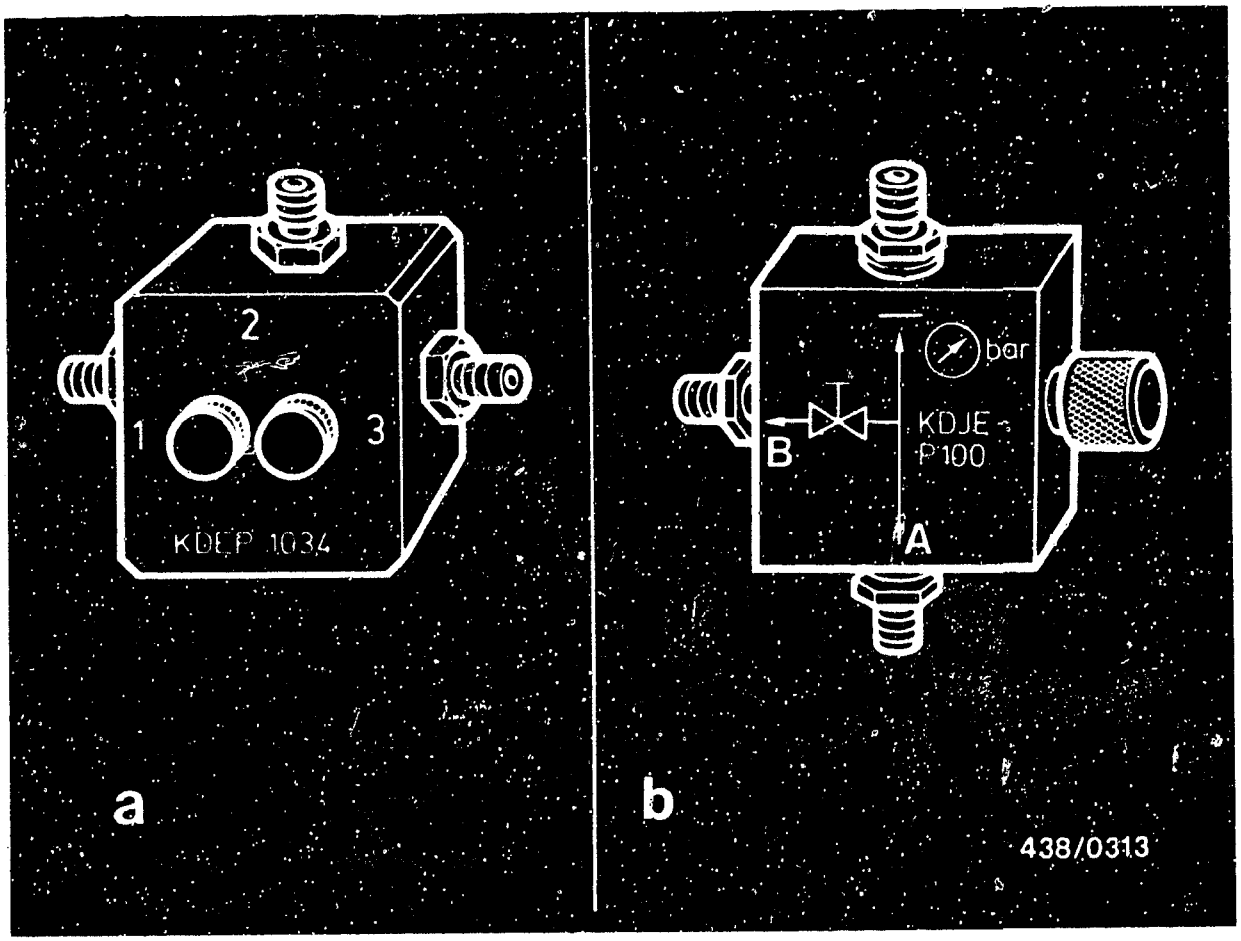
In the case of warm-up regulators with thermo-contact, the correct polarity of the electrical connector must be ensured. In the case of incorrect connection, the thermo-contact will be destroyed.



In the 928/928 S vehicles of model years 1978 to 1980 the correct polarity is not specified. Therefore, when installing the new warm-up regulators, this must be tested and, if necessary, rectified on the connector (+ to +, - to -).

When the warm-up regulator has been replaced or a fault remedied, it is necessary finally to carry out the idle adjustment with the engine at normal operating temperature.

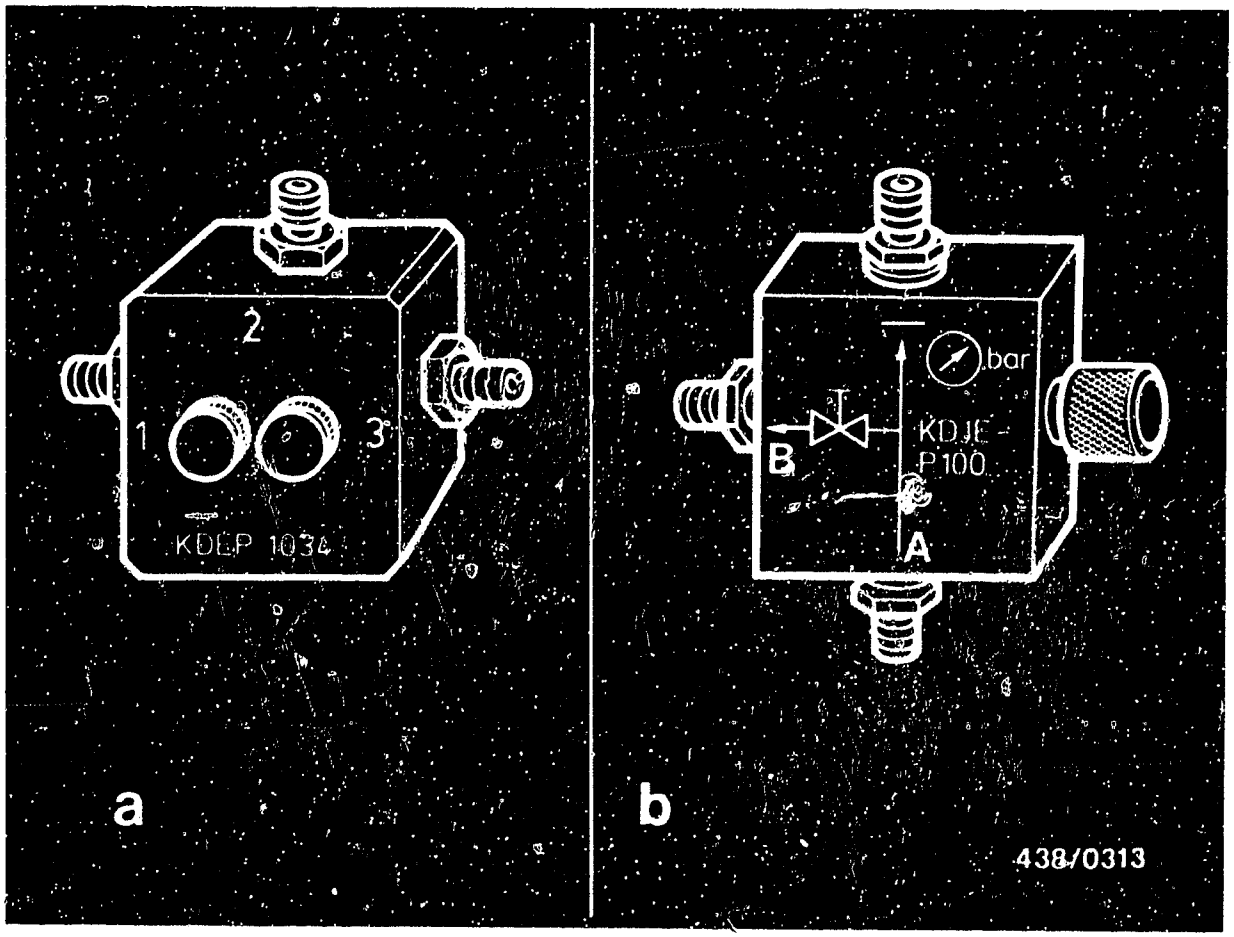
The idle adjustment is described on Coordinate H 21.



15. Testing and adjusting the primary (system) pressure:

15.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

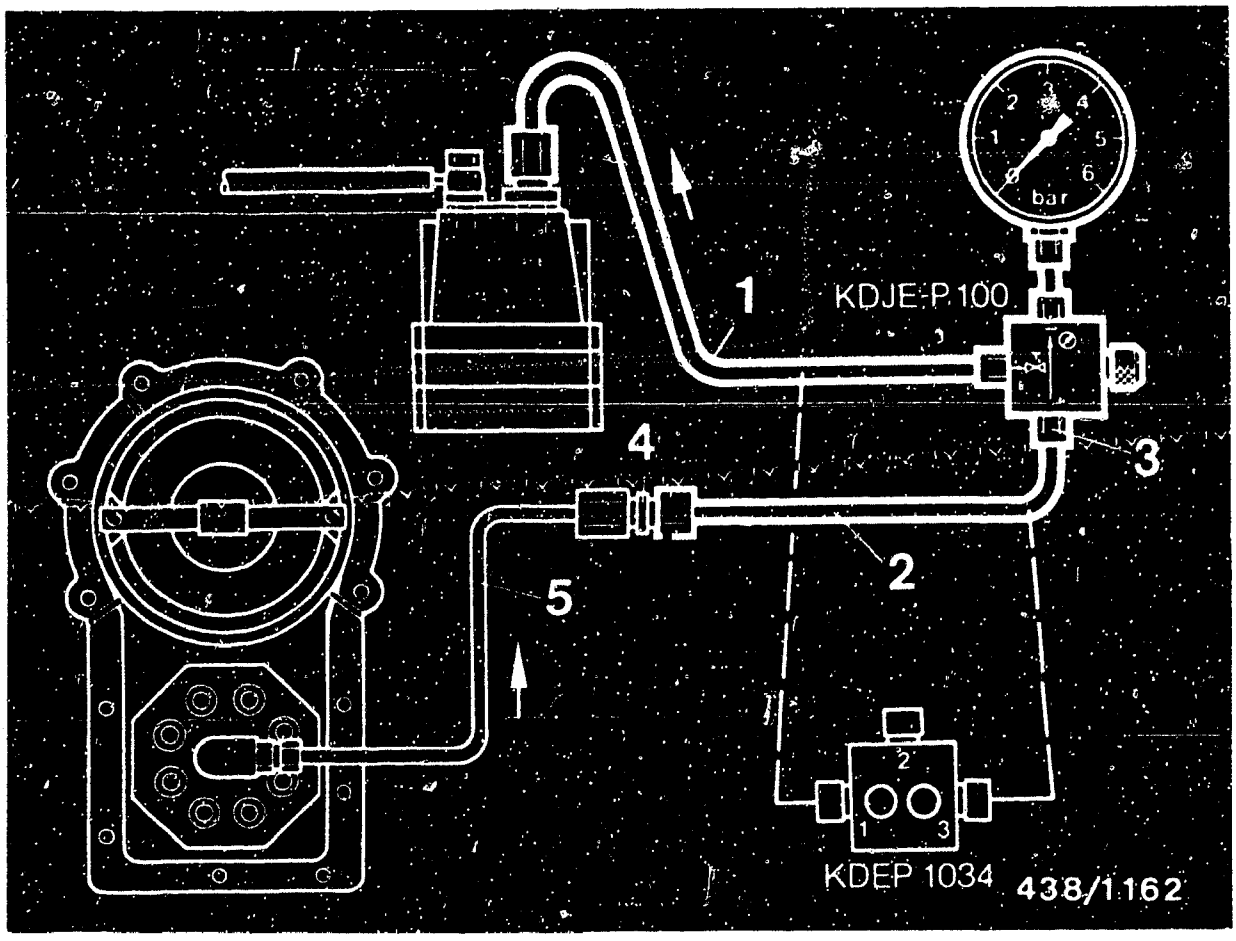
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

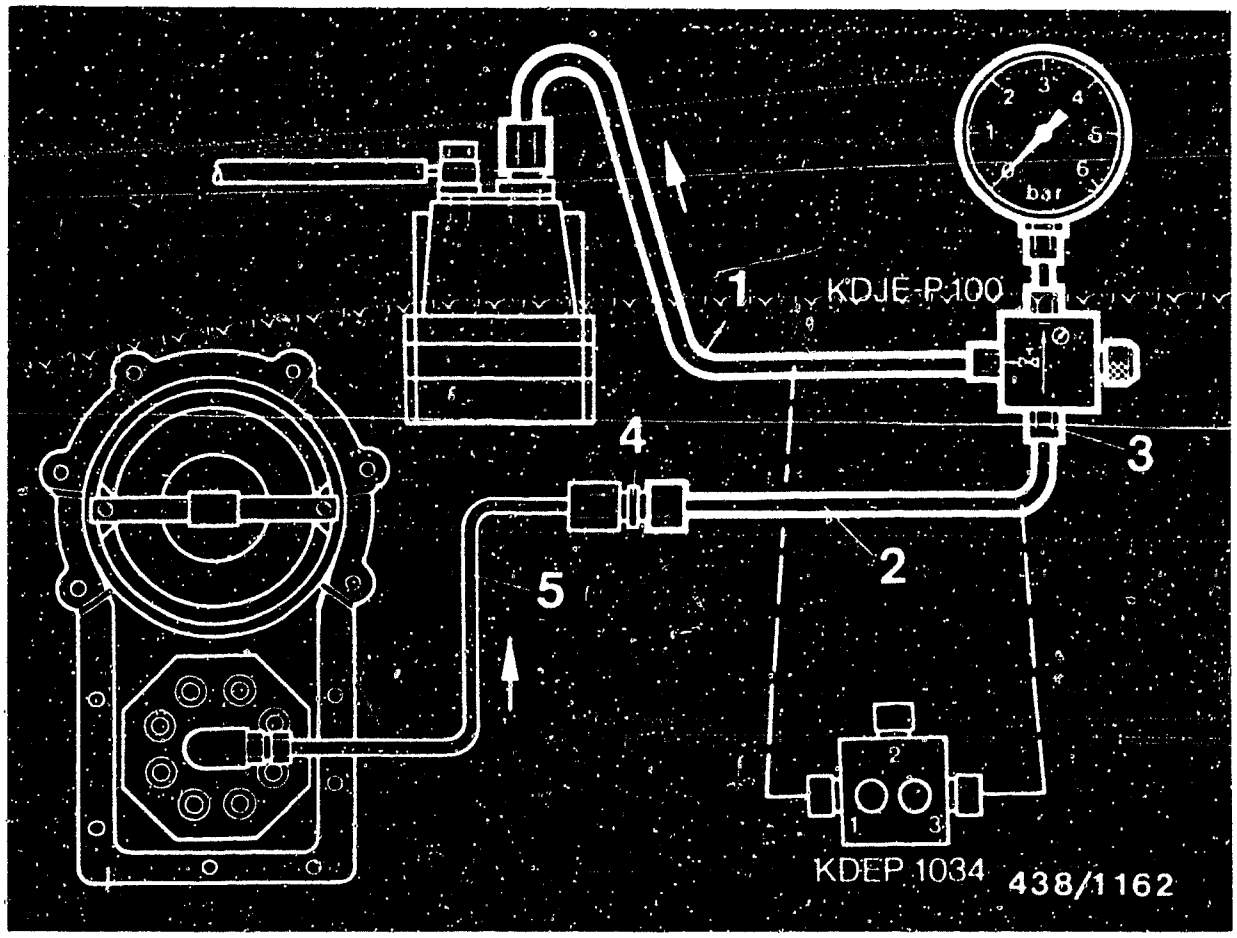
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator on the side of the warm-up regulator.

Mount using connecting-parts set KDJE-P 100/11.

Unscrew control-pressure line (with union nut) on warm-up regulator. Connect hose line from connecting-parts set KDJE-P 100/11 to the warm-up regulator inlet and to directional-control valve, connection B (1).

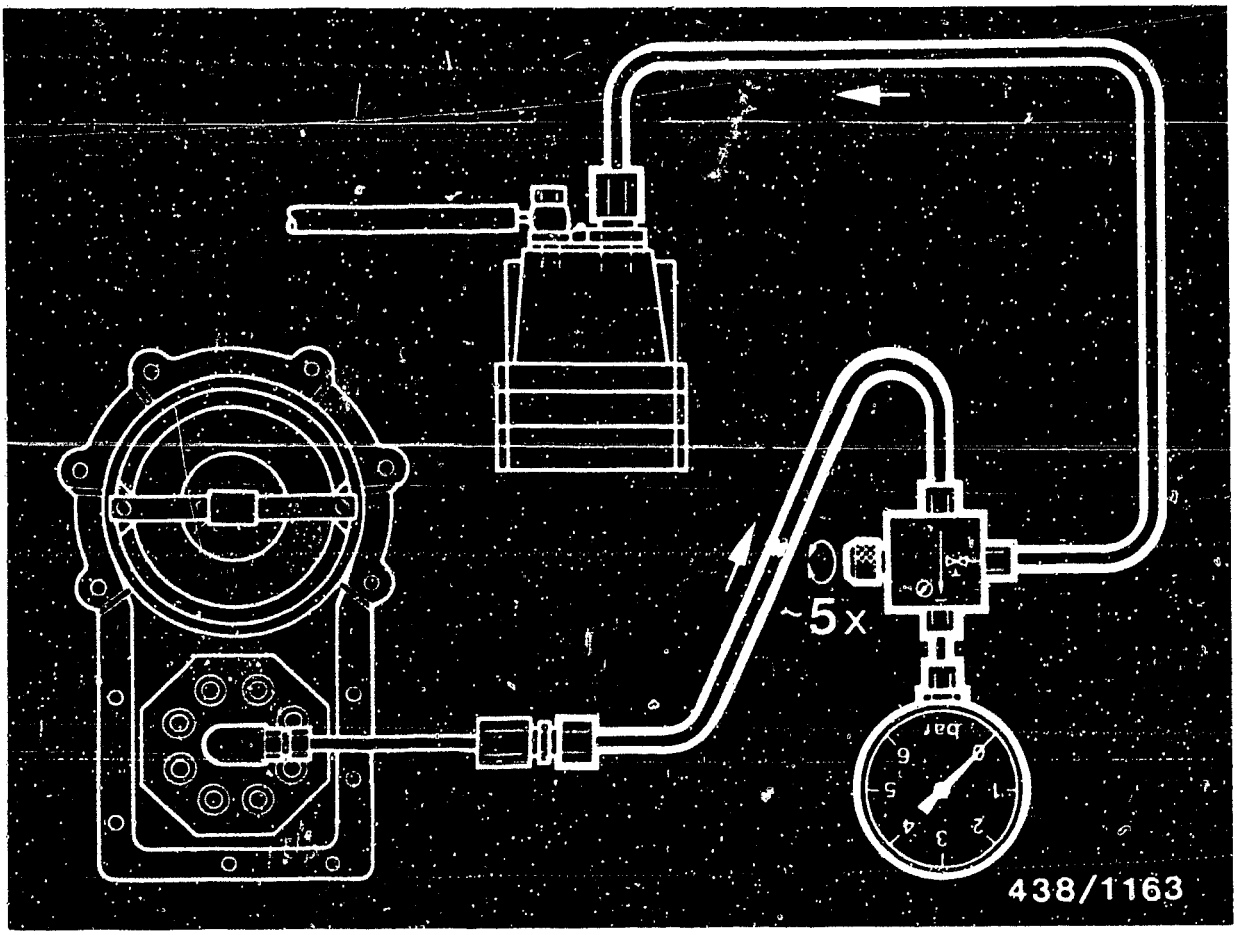


Connect hose line (2) of pressure tester to connection A of directional-control valve (3).

Connect hose line to control-pressure line (5) by means of threaded double fitting (4) of connecting-parts set.

The steel control-pressure line must not be kinked or bent.

Suspend pressure gauge from engine hood.



15.2 Bleeding the pressure tester

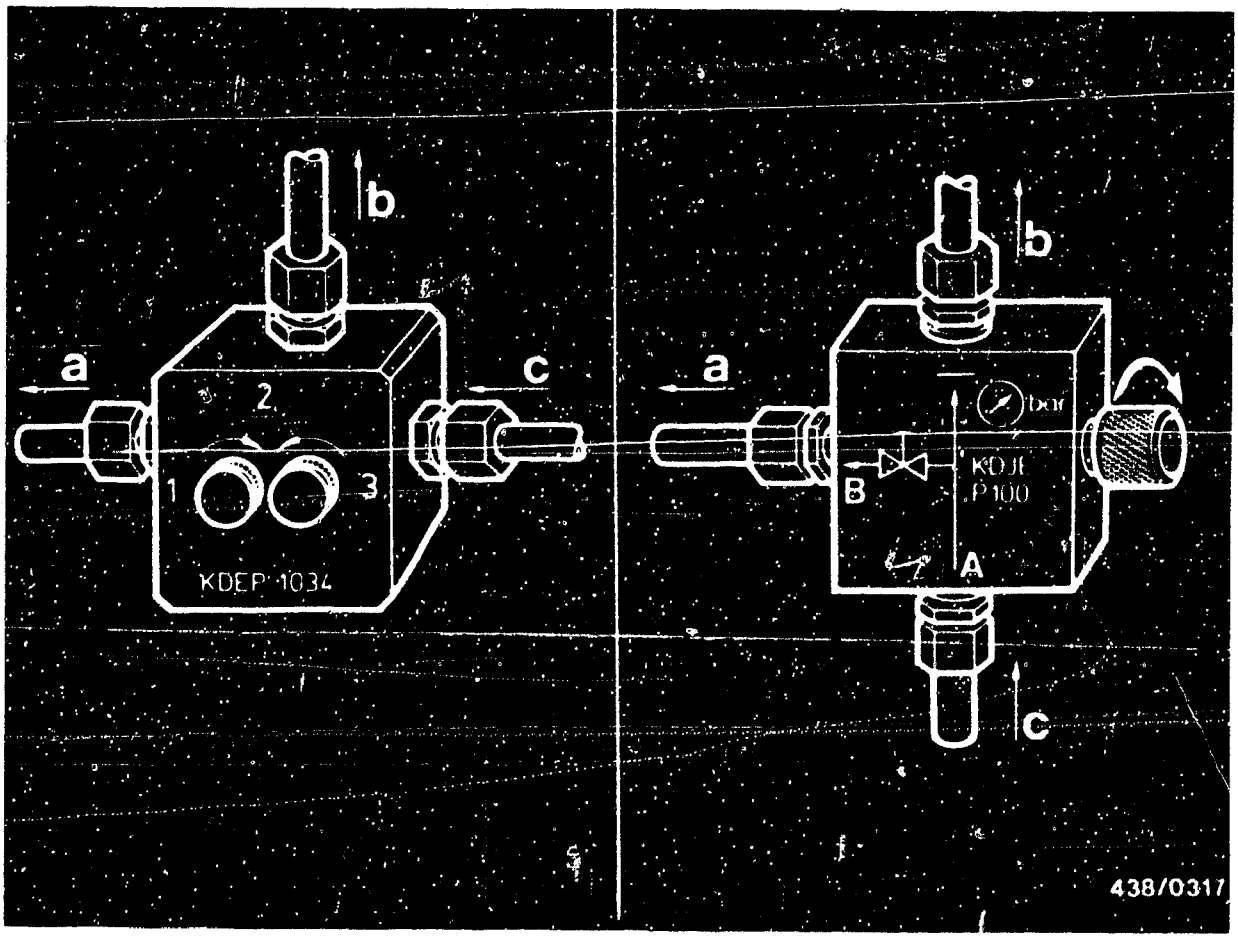
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important.

Close the valve screw of directional-control valve KDJE-P 100. In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.
Primary pressure is now indicated on the pressure gauge.

Fuel distributor part number	Test specifications - primary pressure
0 438 100 027	5.1 ... 5.8 bar (5.2 ... 5.9 kgf/cm²) Gauge pressure

Possible causes of primary pressure being too low:

- Fuel supply not O.K.
  (Delivery of electric fuel pump too low)

- Primary pressure incorrectly set.

Resetting the primary pressure always presupposes that the fuel supply is O.K.

Set values for fuel delivery:

1978 model with 2 electric fuel pumps: min. 1360 cm³/30 s

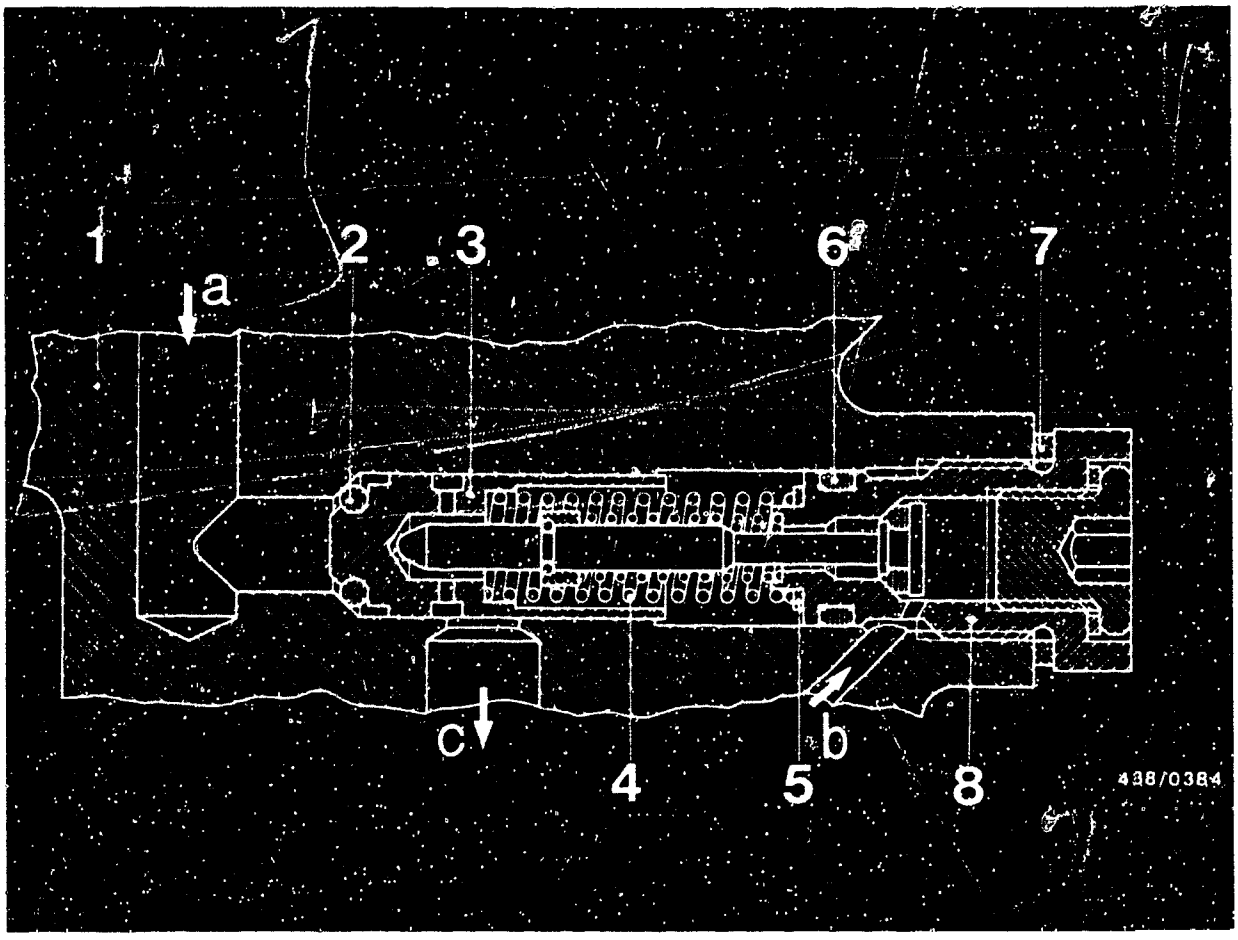
Models as of 1979 with 1 electric fuel pump: min. 1120 cm³/30 s

Possible causes of primary pressure being too high:

- Constriction in return line to fuel tank

- Primary pressure regulator incorrectly set.

If the primary pressure is too high, before re-adjusting, therefore, always check the condition of the return line to the fuel tank.

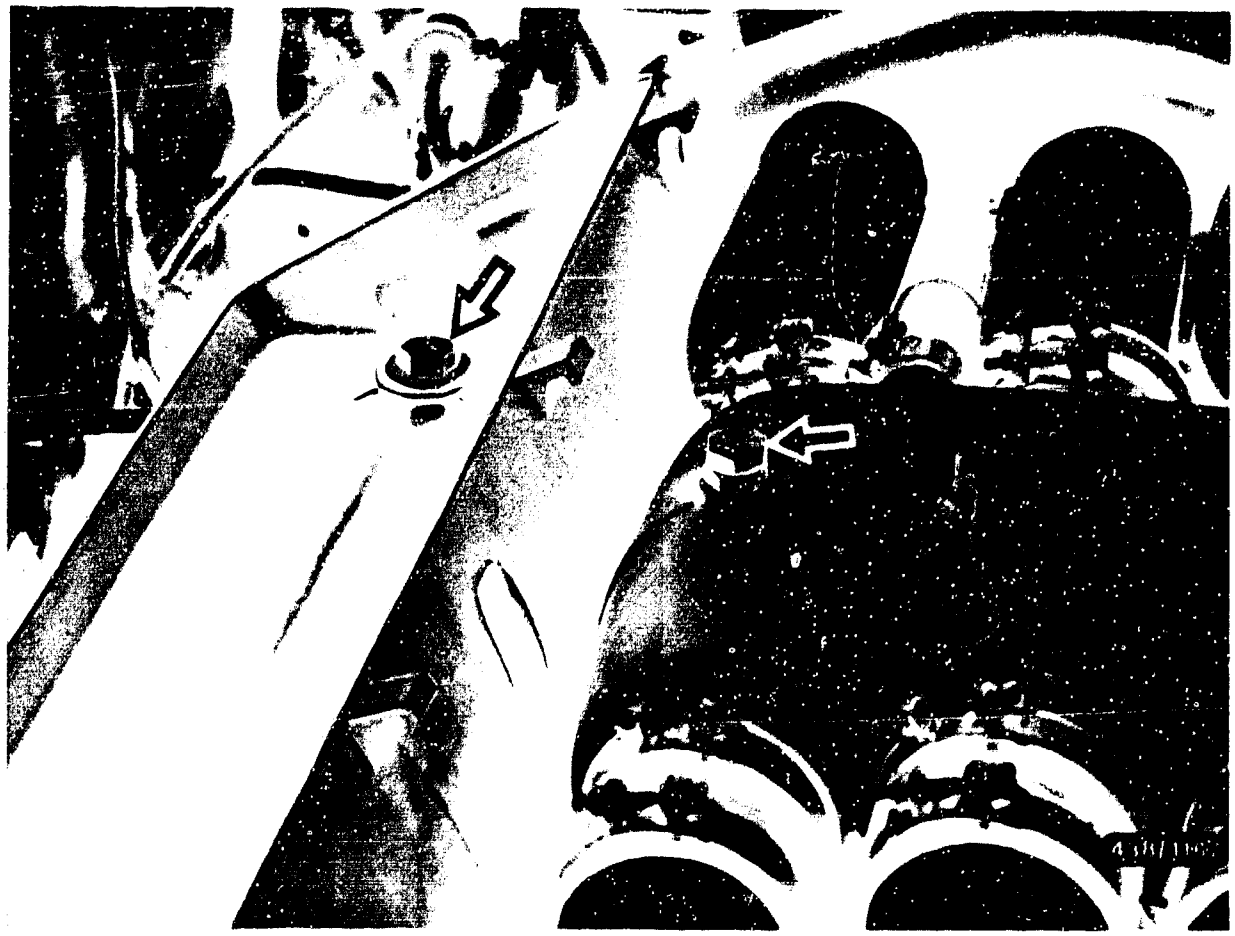


a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

15.4 Adjusting the primary pressure:

Primary-pressure adjustment values:

Fuel distributor Part No.	Adjustment values - Primary pressure
0 438 100 027	5.3...5.5 bar (5.4...5.6 kgf/cm²)

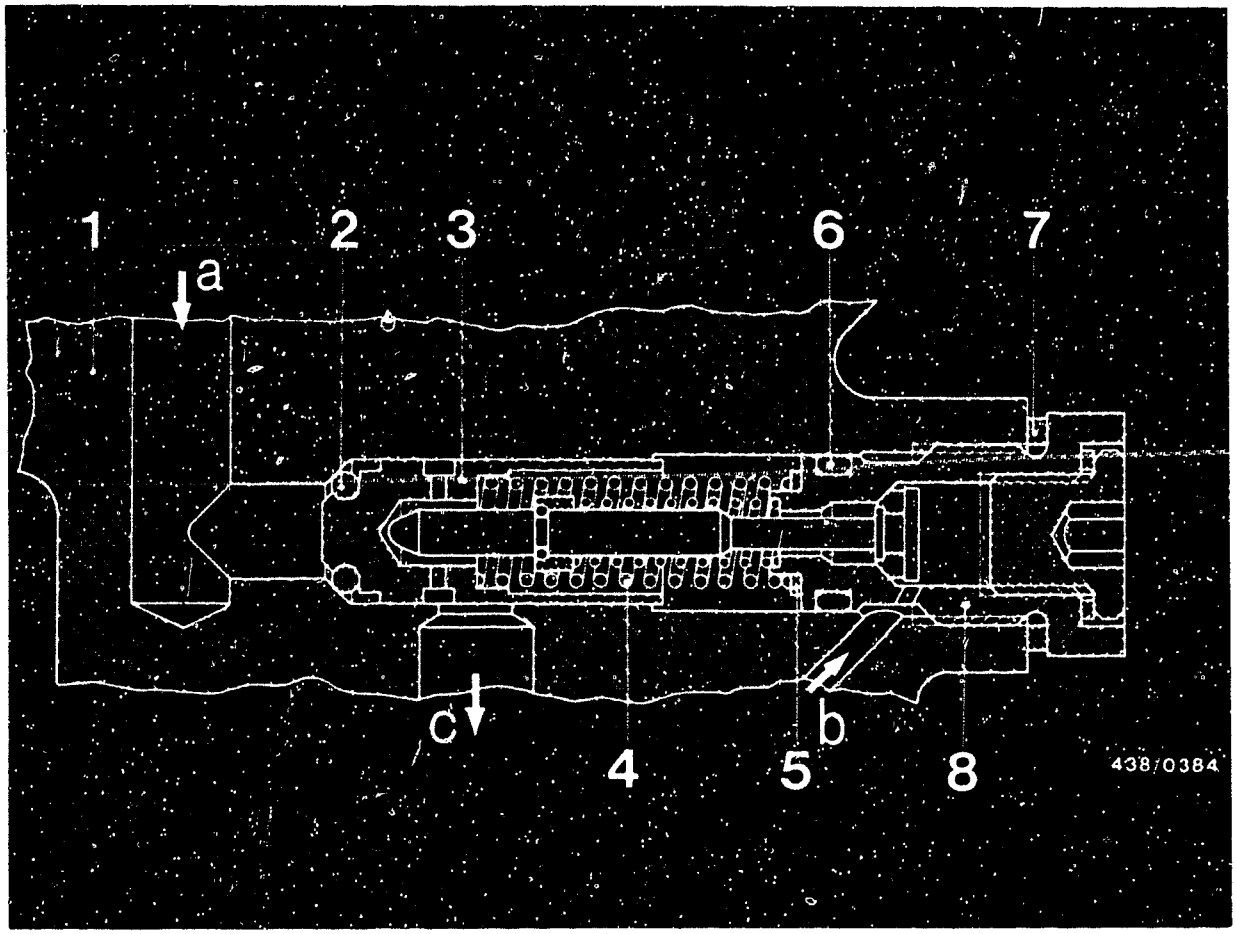


To make the primary-pressure regulator in the fuel distributor accessible, remove the complete air filter.

Remove both intake-air hoses.

Remove air filter top part (unhook 4 clamping bands).

Unscrew the pressure screw in the intake manifold as well as the fastening screws in the air-filter housing (arrows), and withdraw filter housing to the right.

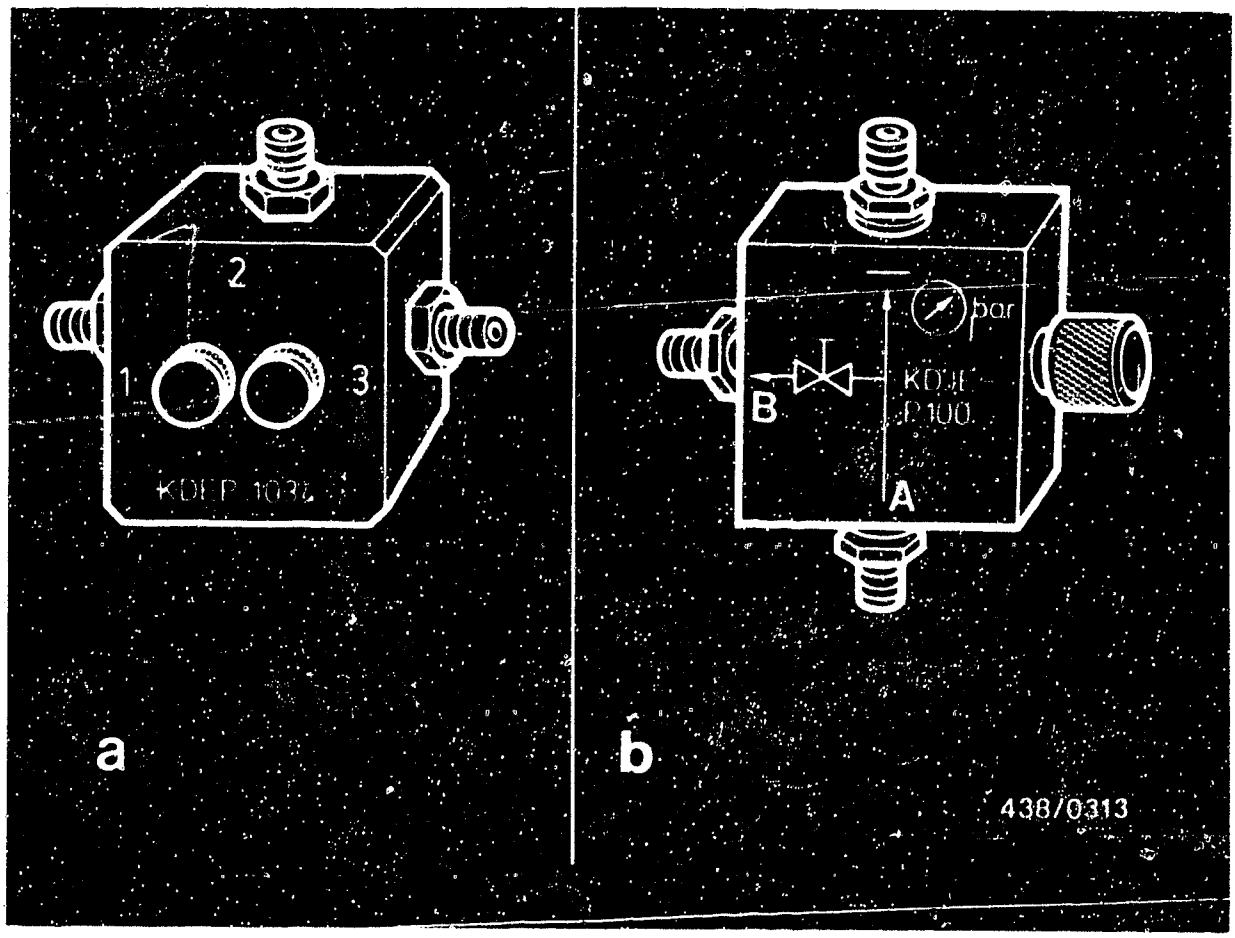


The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 8) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 7) and O-ring (Item 6).

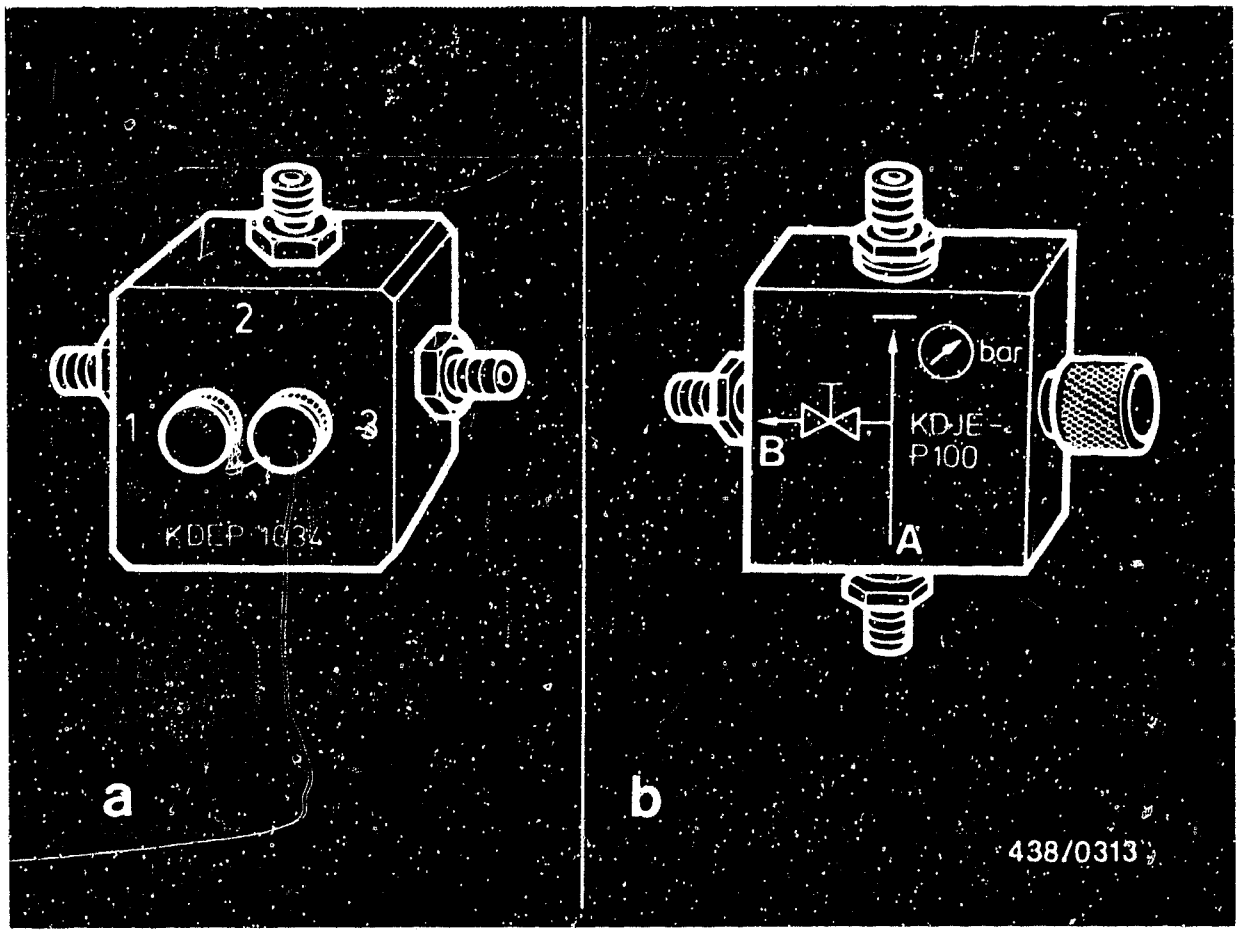
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



16. Testing the entire fuel system for leaks.

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

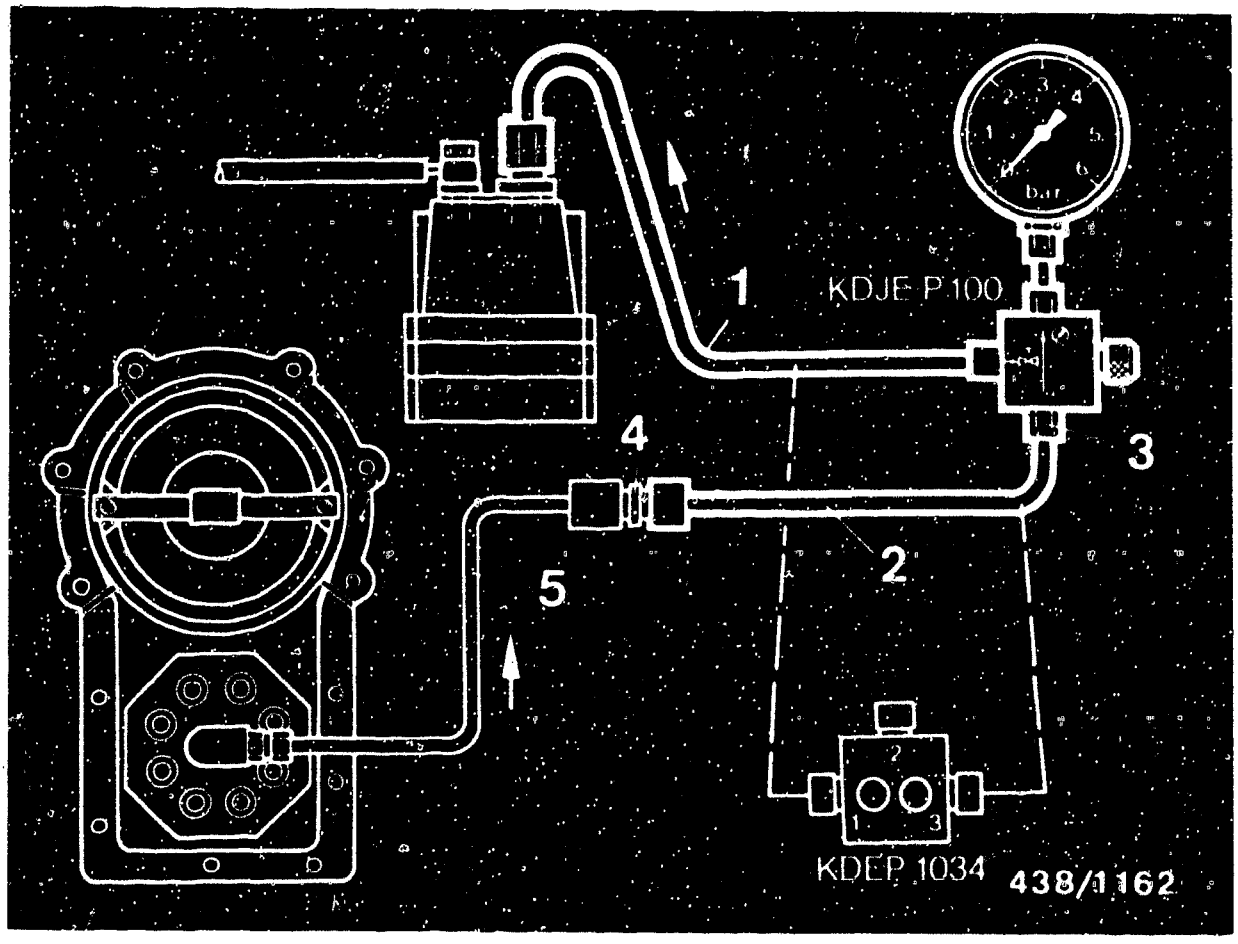


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

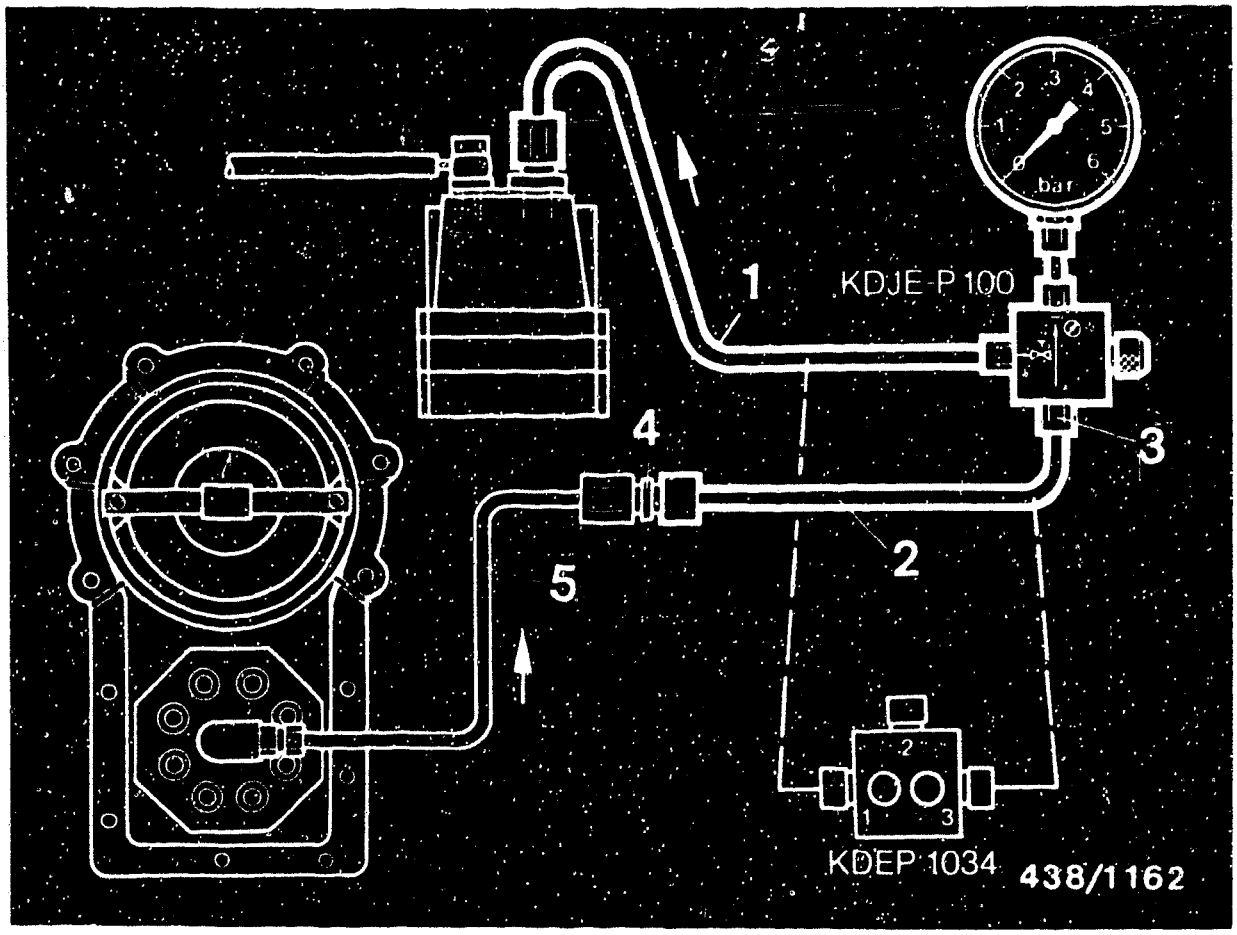
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator on the side of the warm-up regulator.

Mount using connecting-parts set KDJE-P 100/11.

Unscrew control-pressure line (with union nut) on warm-up regulator. Connect hose line from connecting-parts set KDJE-P 100/11 to the warm-up regulator inlet and to directional-control valve, connection B (1).

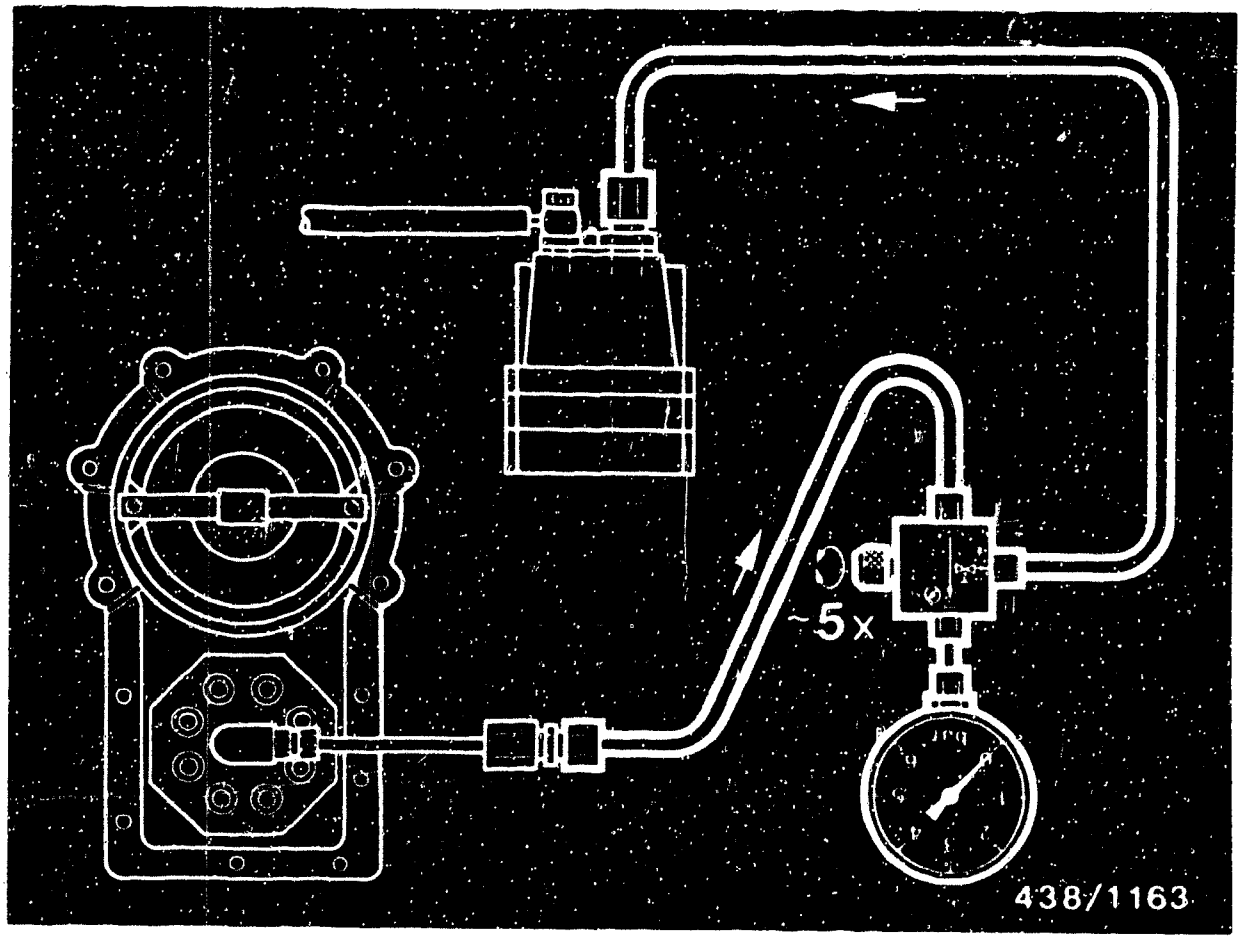


Connect hose line (2) of pressure tester to connection A of directional-control valve (3).

Connect hose line to control-pressure line (5) by means of threaded double fitting (4) of connecting-parts set.

The steel control-pressure line must not be kinked or bent.

Suspend pressure gauge from engine hood.



16.2 Bleeding the pressure tester

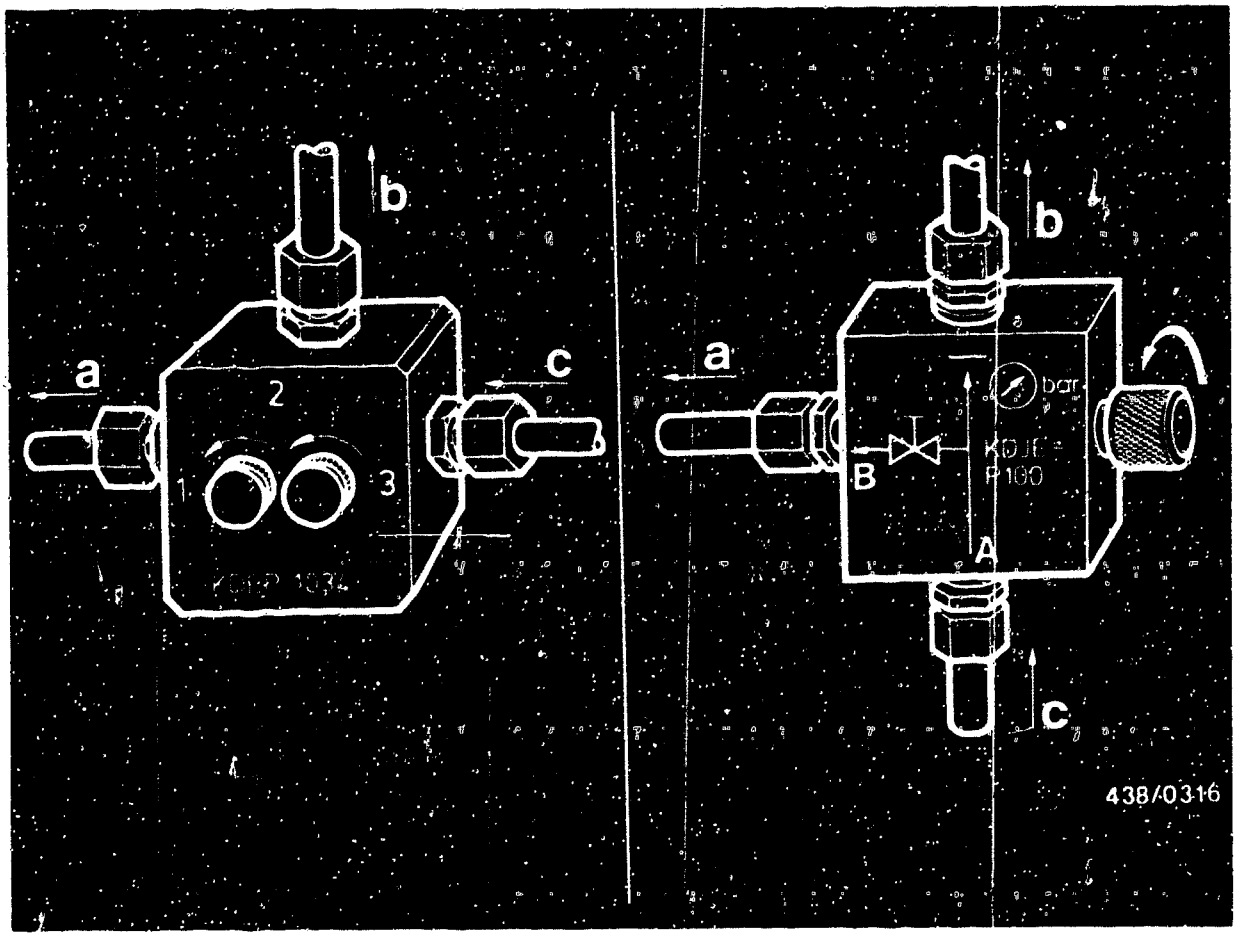
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case fo KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

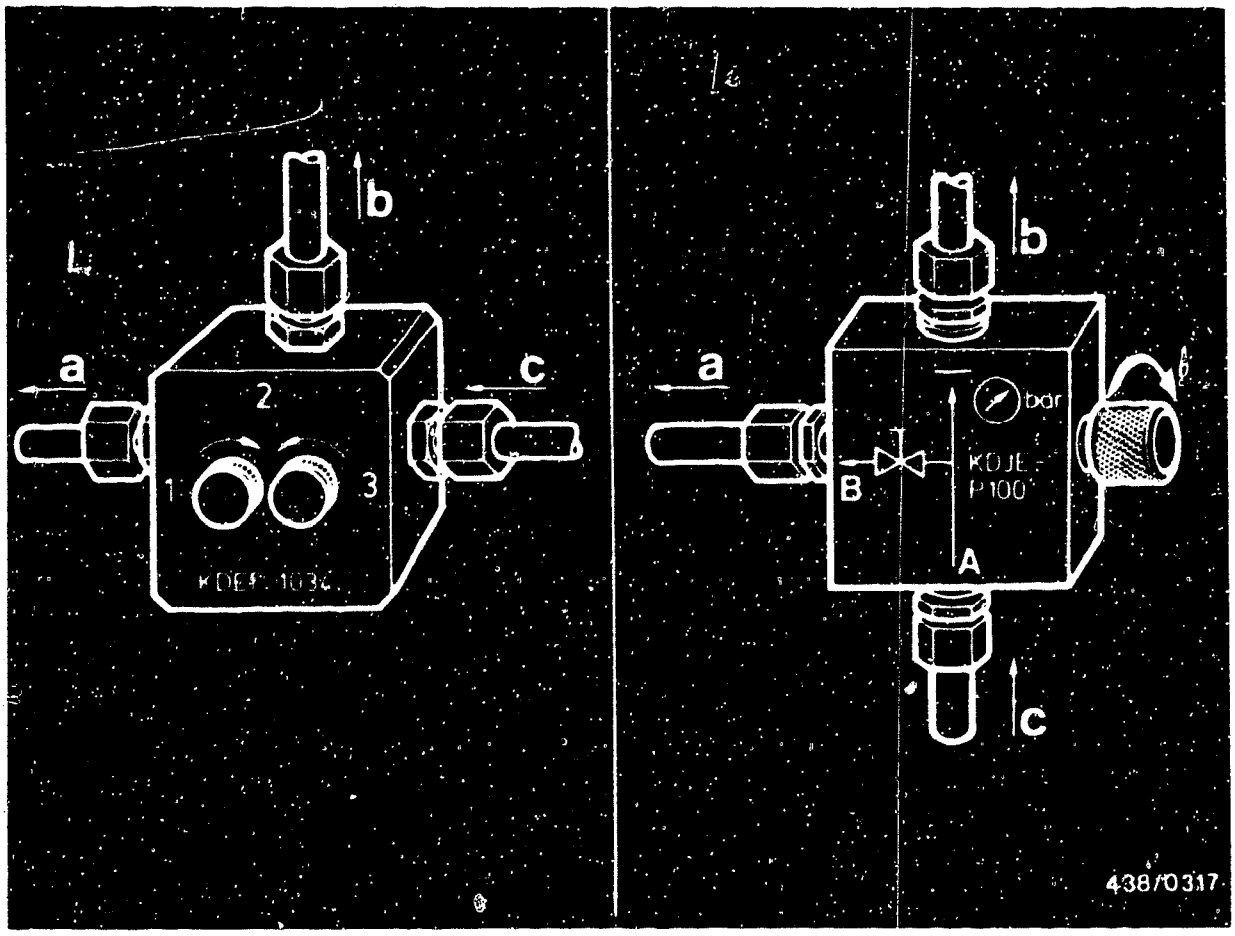
Test specifications for leak test:

All models worldwide:
(fuel accumulator
0 438 170 026)

Minimum pressure after 10 minutes:	2.7 bar (2.8 kgf/cm²)
Minimum pressure after 20 minutes:	2.6 bar (2.7 kgf/cm²)

78/79 model USA:
(fuel accumulator
0 438 170 022; ... 025)

Minimum pressure after 10 minutes:	2.0 bar (2.1 kgf/cm²)
Minimum pressure after 20 minutes:	1.7 bar (1.8 kgf/cm²)

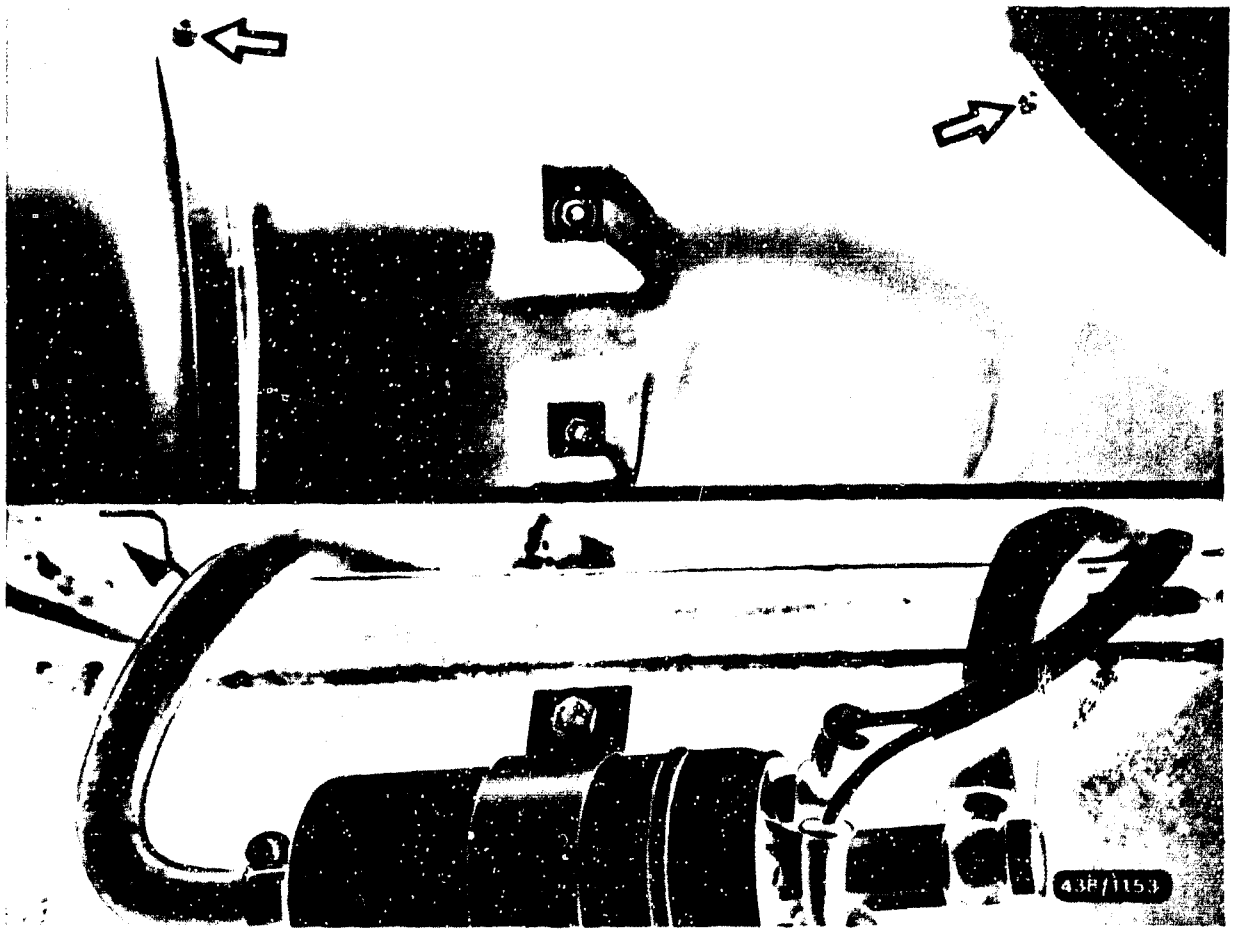


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 3.

If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



16.4 Possible causes of trouble in the primary-pressure circuit:

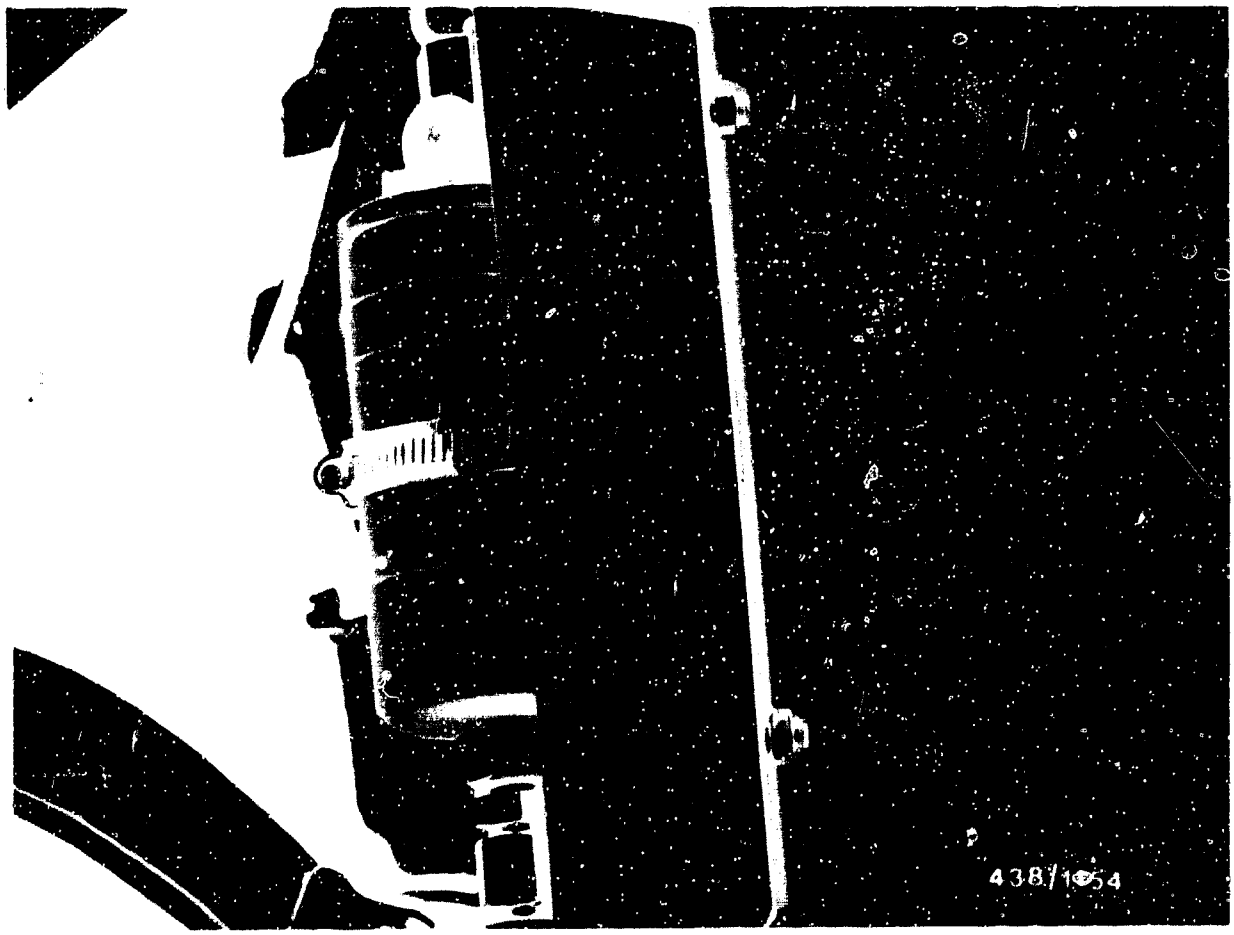
- Non-return valve in delivery-side fitting of electric fuel pump leaking

Installation position of electric fuel pump:

The electric fuel pump is mounted directly on the fuel tank on a mounting plate.

After loosening the upper fastening screws (arrows), it is possible to hinge down the mounting plate, thus making the pump accessible.

On the 1978 model (equipped with 2 electric fuel pumps) electric pump 1 is mounted in this position.



Electric fuel pump 2 on the 1978 model is under the right-hand rear fender near the fuel-tank filler neck.

It is accessible from the wheel box after removing the dirt-deflector plate.

The Porsche 928/928 S is/was equipped with the following versions of electric fuel pump:

1978 model: Electric fuel pump 1 = 0 580 254 984

Electric fuel pump 2 = 0 580 254 979

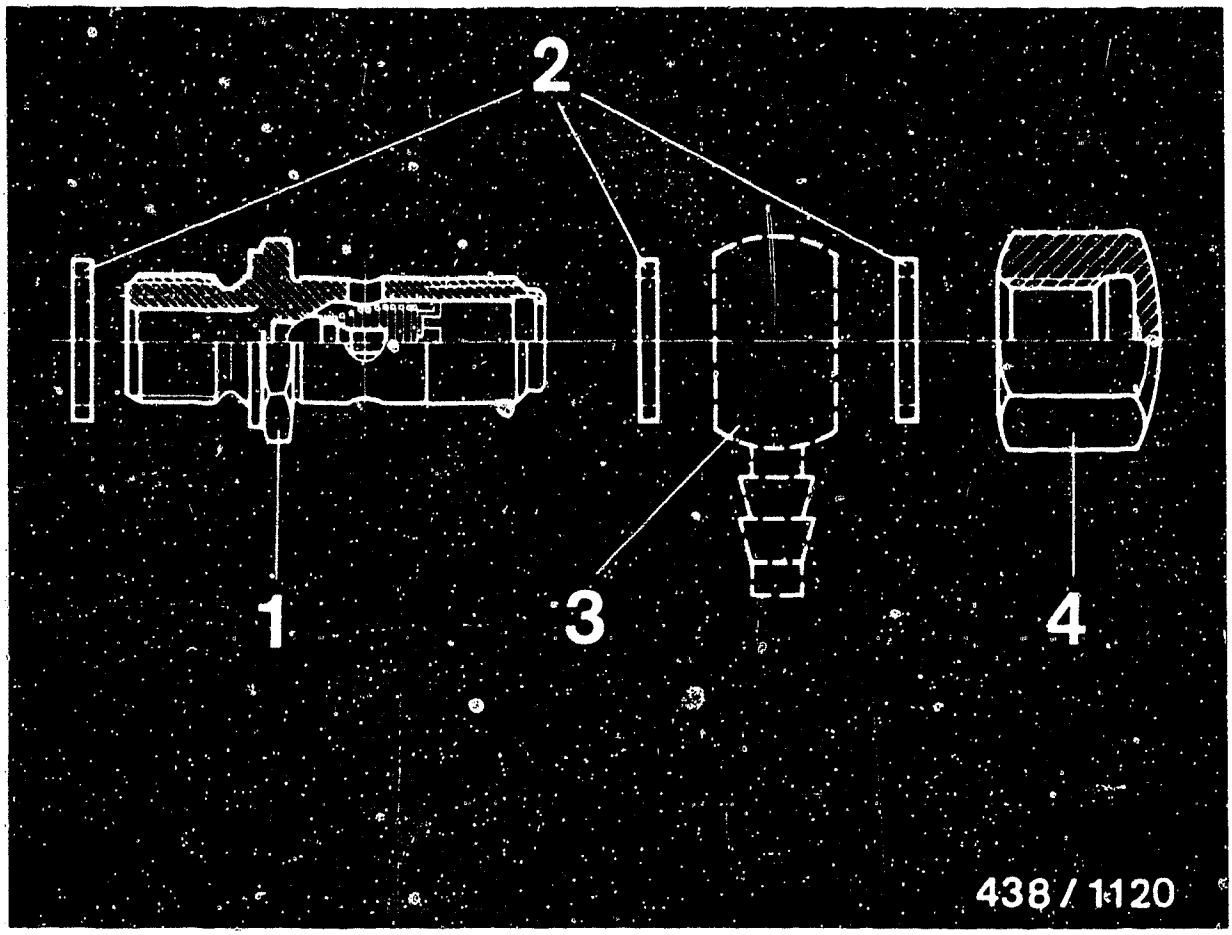
1979 to 1980 model: 0 580 254 984

as of 1981 model: 0 580 254 967

In the versions ... 984 and ... 979 the non-return valve is permanently integrated in the delivery-side fitting and cannot be replaced.
If the non-return valve is leaking, to avoid having to replace the complete electric fuel pump, a suitable parts set with separate non-return valve has been specified and released.

Part number of parts set: 1 587 010 003.

Note: On the 1978 model, for the symptom "non-return valve in fitting of electric fuel pump leaking", the non-return valves of both electric fuel pumps must be leaking. Therefore, equip both pumps with new non-return valves.



Contents of parts set:

1 = Tube fitting
2 = Seal ring
3 = Inlet union
4 = Cap nut

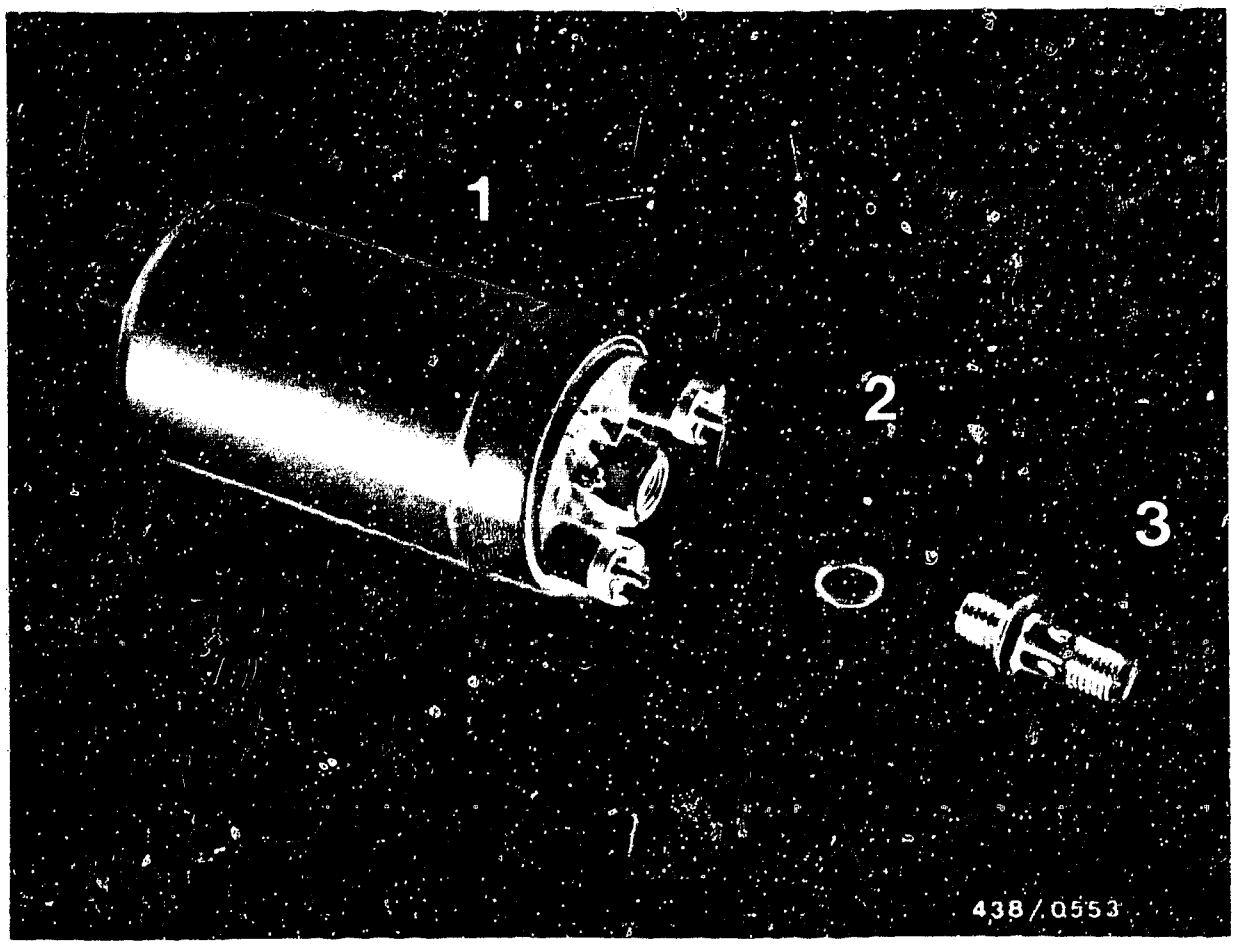
Installation:

Thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (fuel tank - electric fuel pump) (e.g. using hose clamper W 157 from Matra Co.).
Screw off the delivery line, collecting any escaping fuel.

The defective original non-return valve remains in the electric fuel pump.

Screw a tube fitting of the parts set (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm.
At the same time apply a wrench to the hexagonal section of the pressure connection piece.
Fit a thin flat seal ring, fuel-line inlet union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from intake hose.

Check connections for leaks with the electric fuel pump in operation.



1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting

The electric fuel pump 0 580 254 967 (as of 1981 model) is originally equipped with a tube fitting with integrated non-return valve.

This non-return valve is obtainable with the appropriate flat seal ring as a parts set under the number 1 587 010 002.

Thoroughly clean connection of delivery line on electric fuel pump.
Pinch off intake hose (between fuel tank and electric fuel pump) (e.g. using hose clamper W 157 from Matra Co.).
Unscrew delivery line, catching any escaping fuel.

Special note:

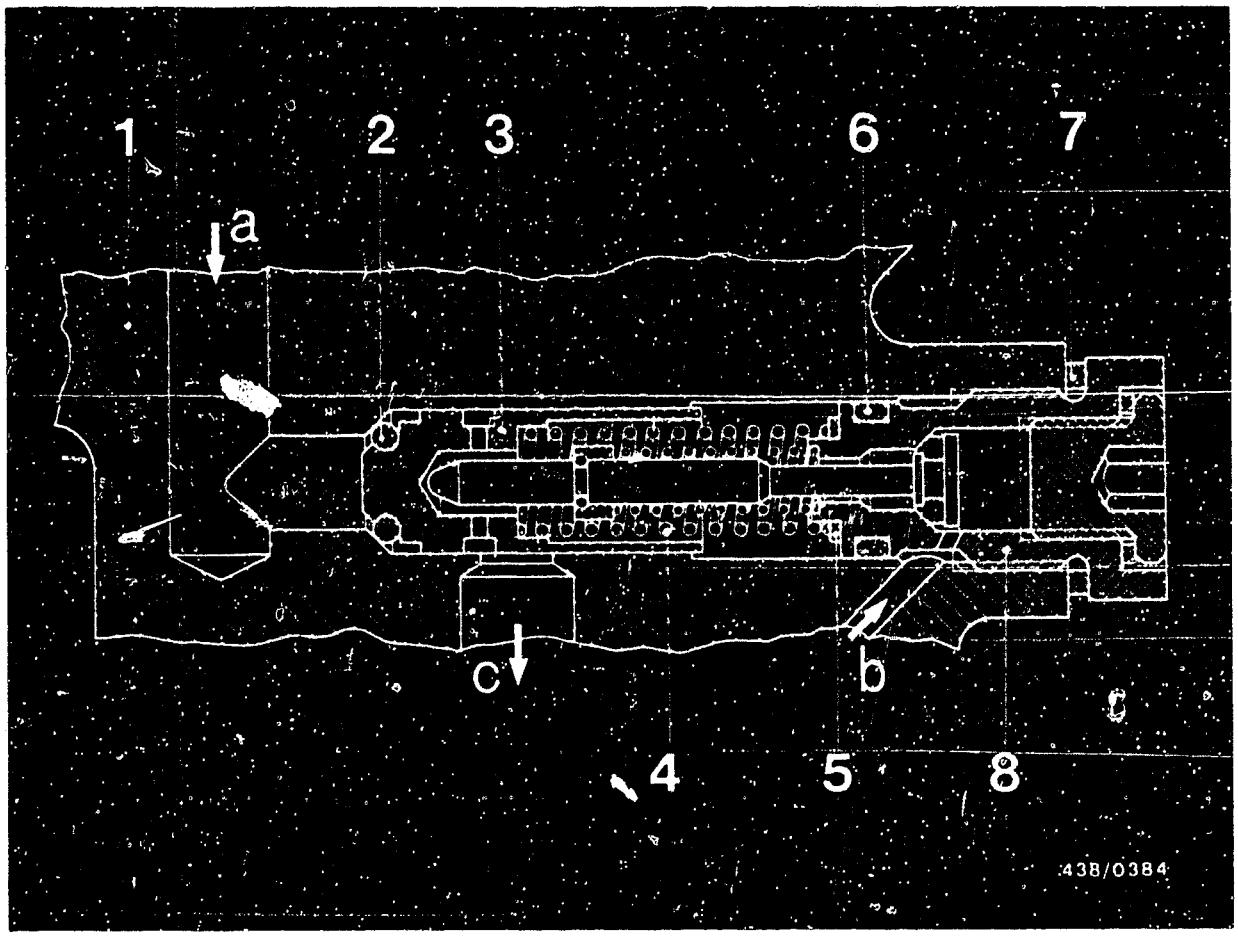
When loosening and tightening the non-return valve, hold the fixed hexagonal section of the electric fuel pump with a flat, thin-walled box wrench. Make sure that the electrical terminals are not damaged.

Screw the new tube fitting (short end) with a thick flat seal ring into the delivery fitting and tighten to a torque of 17 ... 25 Nm.

Fit a thin flat seal ring, inlet union of fuel line and other flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.

Remove hose clamper from intake hose.

Check connections for leaks with electric fuel pump operating.



a = Primary pressure
b = From warm-Up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug

Further possible cause of leaks in the primary-pressure circuit:

- Seal ring (O-ring) on control piston of primary-pressure regulator has a leak.

Replace the seal ring.
Clean the fuel distributor in the region of the primary-pressure regulator.

Unscrew the large screw plug (8) with the complete push-up valve. Also remove the shims (5), control spring (4) and control plunger (3).

Replace the seal ring (O-ring) (2) on the control plunger. Install the control plunger and the control spring.

Screw in the screw plug with the complete push-up valve and with shims (as found when removing) and new seal rings (6 and 7).

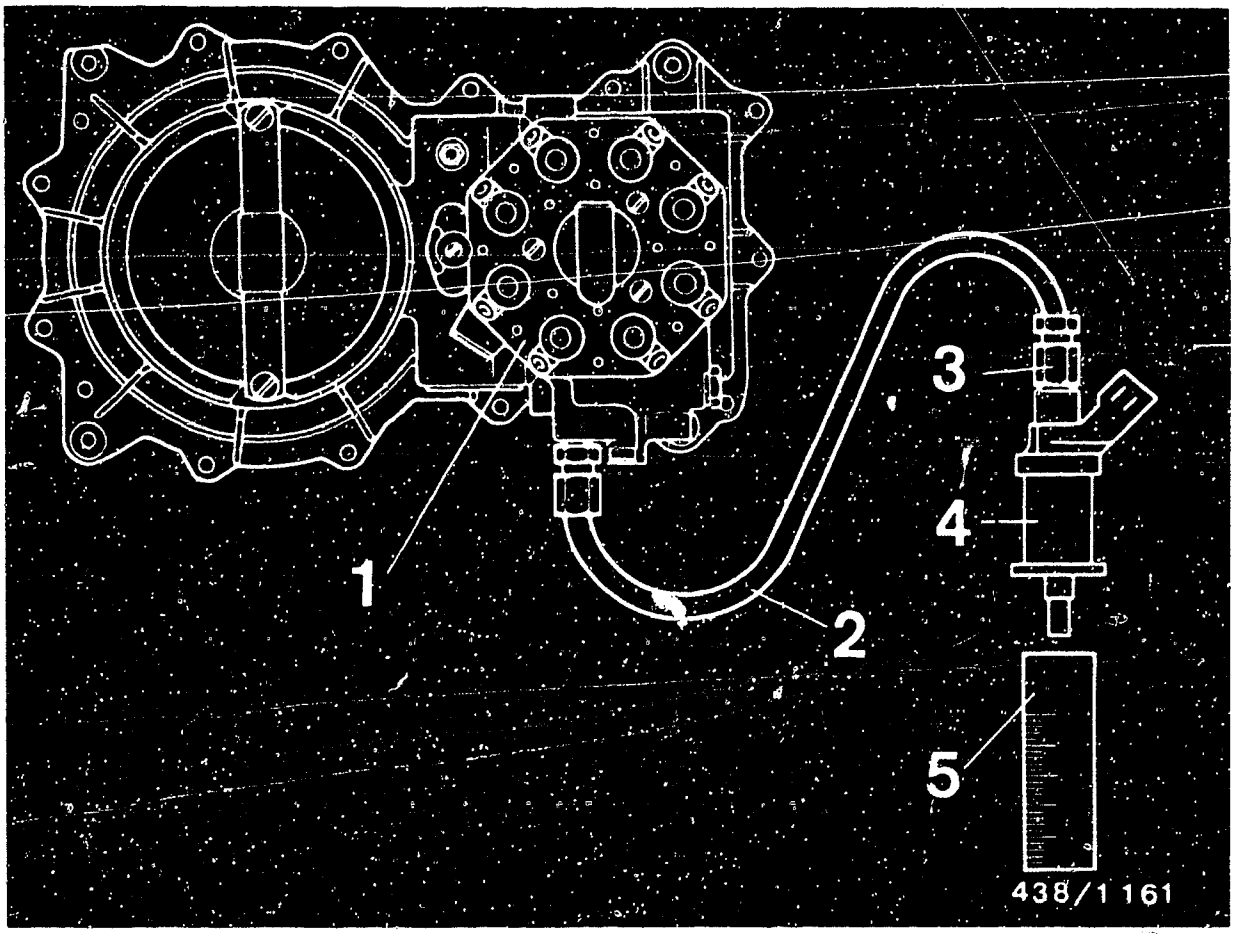
Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure:

Fuel distributor 0 438 100 027

Checking value 5,1...5,6 bar (5,2...5,9 kgf/cm² gauge pressure

Setting value 5,3...5,5 bar (5,4...5,6 kgf/cm²) gauge pressure



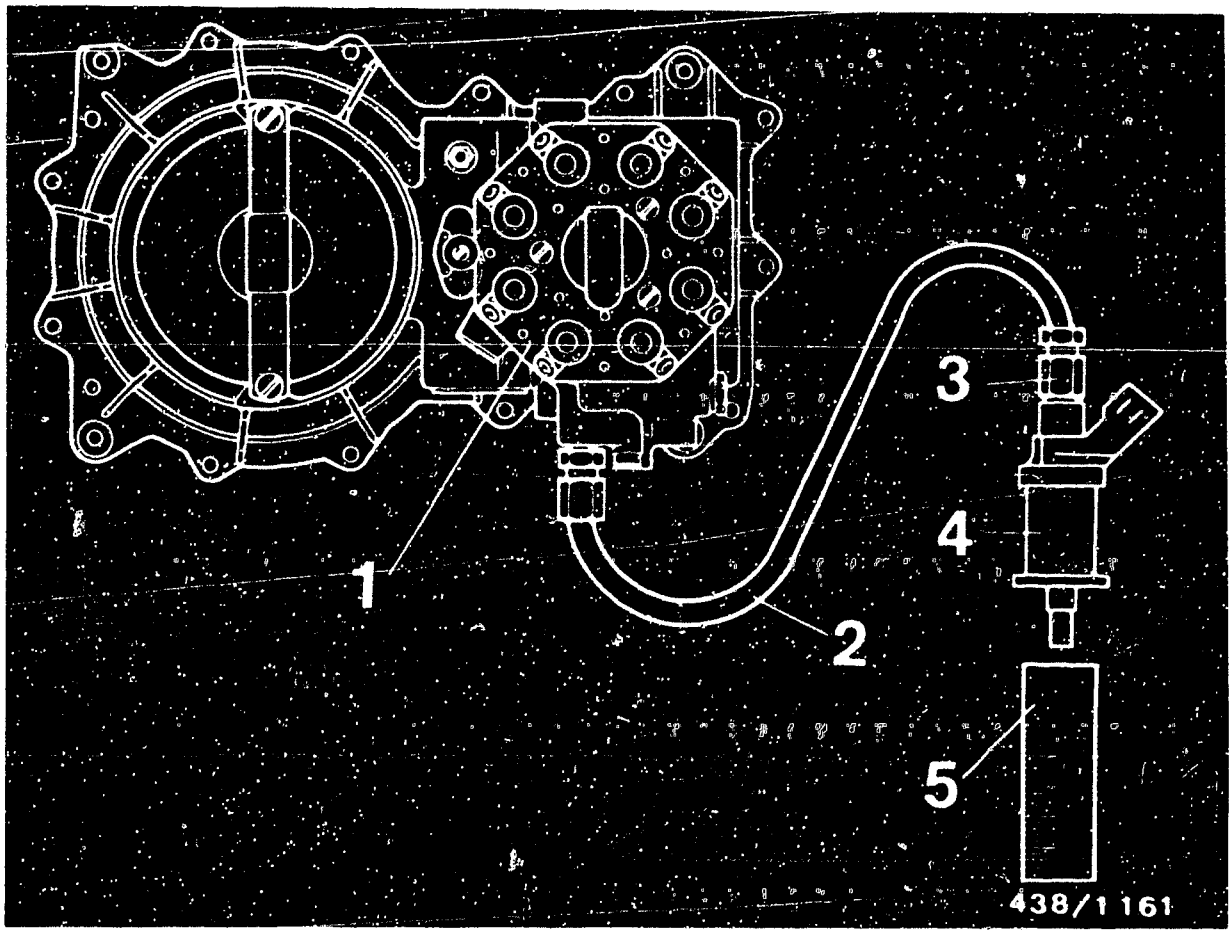
1 = Mixture-control unit
2 = Hose line from KDJE-P 100/11
3 = Threaded double fitting from KDJE-P 100/10
4 = Start valve
5 = Graduate

Further possible cause of leaks in the primary-pressure circuit:

- Start valve leaking

Remove start valve for testing.

Unscrew fuel line to start valve on fuel distributor.

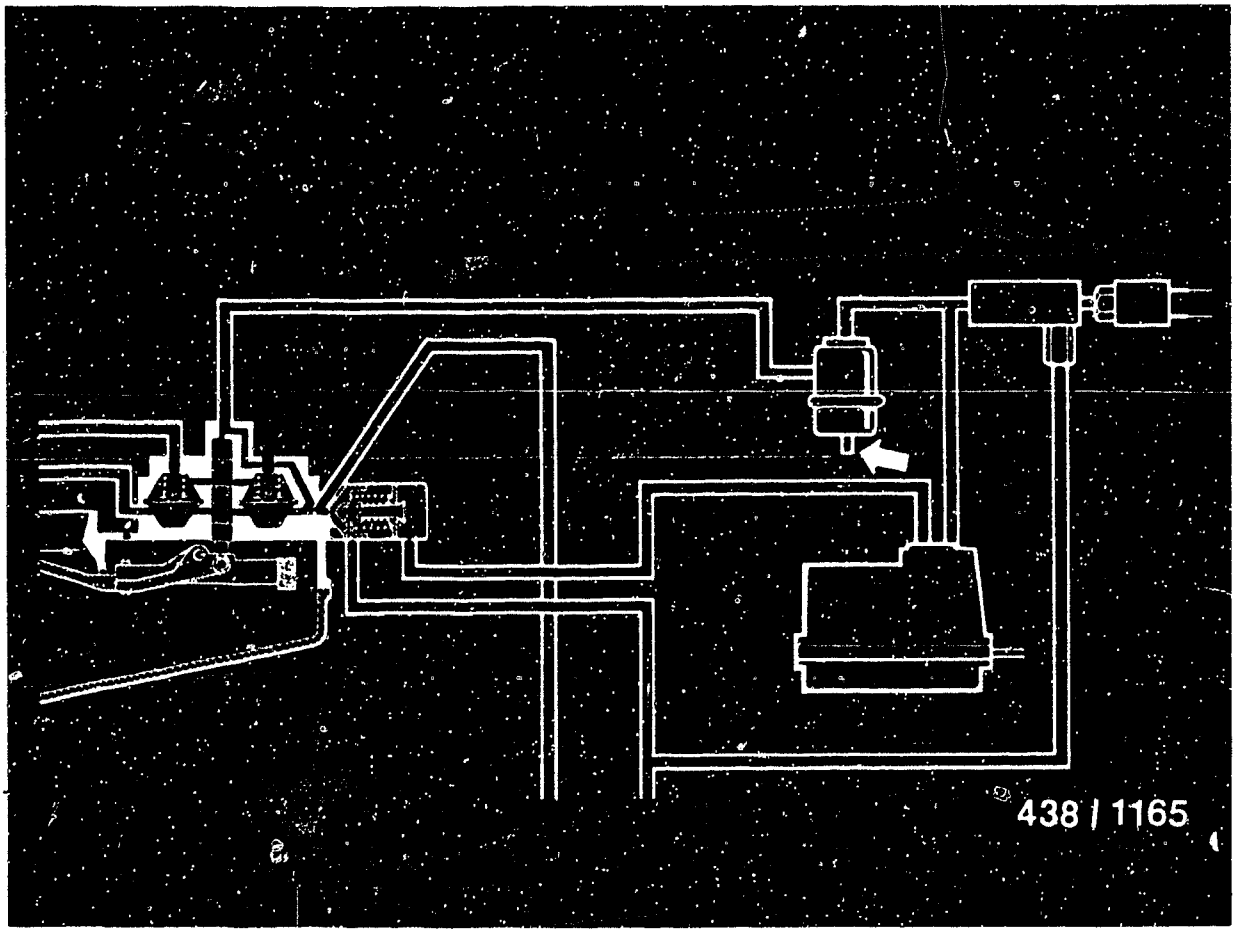


Using the hose line from the connecting-parts set KDJE-P 100/11 and the threaded double fitting M 12 x 1.5 /M 8 x 1 from connecting-parts set KDJE-P 100/10, connect the start valve directly to the start valve connection on the fuel distributor.

Switch on the electric fuel pump by bridging the safety circuit.

No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again. Replace the start valve if it does not open or if it leaks.

If a leaky start valve has been replaced, it is necessary finally to perform the idle adjustment with the engine at normal operating temperature.
The idle adjustment is described on Coordinates H 21.



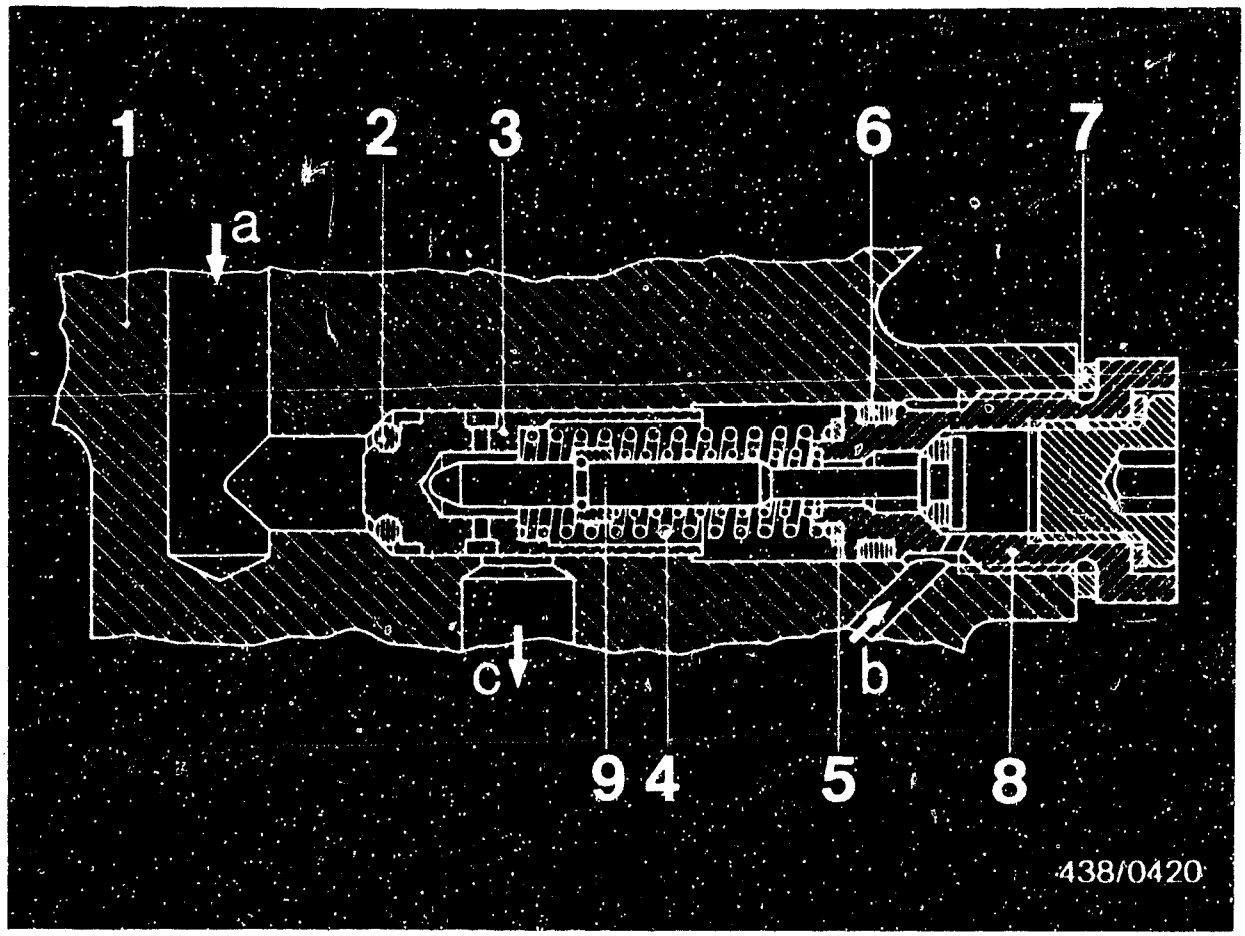
Further possible cause of leaks in the primary-pressure circuit:

- Fuel-line-pressure damper in control-pressure line from fuel distributor to warm-up regulator leaking.

  Note: Concerns only vehicles as of 1981 model or vehicles of earlier years which have been retrofitted with fuel distributor with capsule valve.

The fuel-line-pressure damper is in the control-pressure circuit, but the method of connecting the pressure tester means that it is covered when testing the primary-pressure circuit.

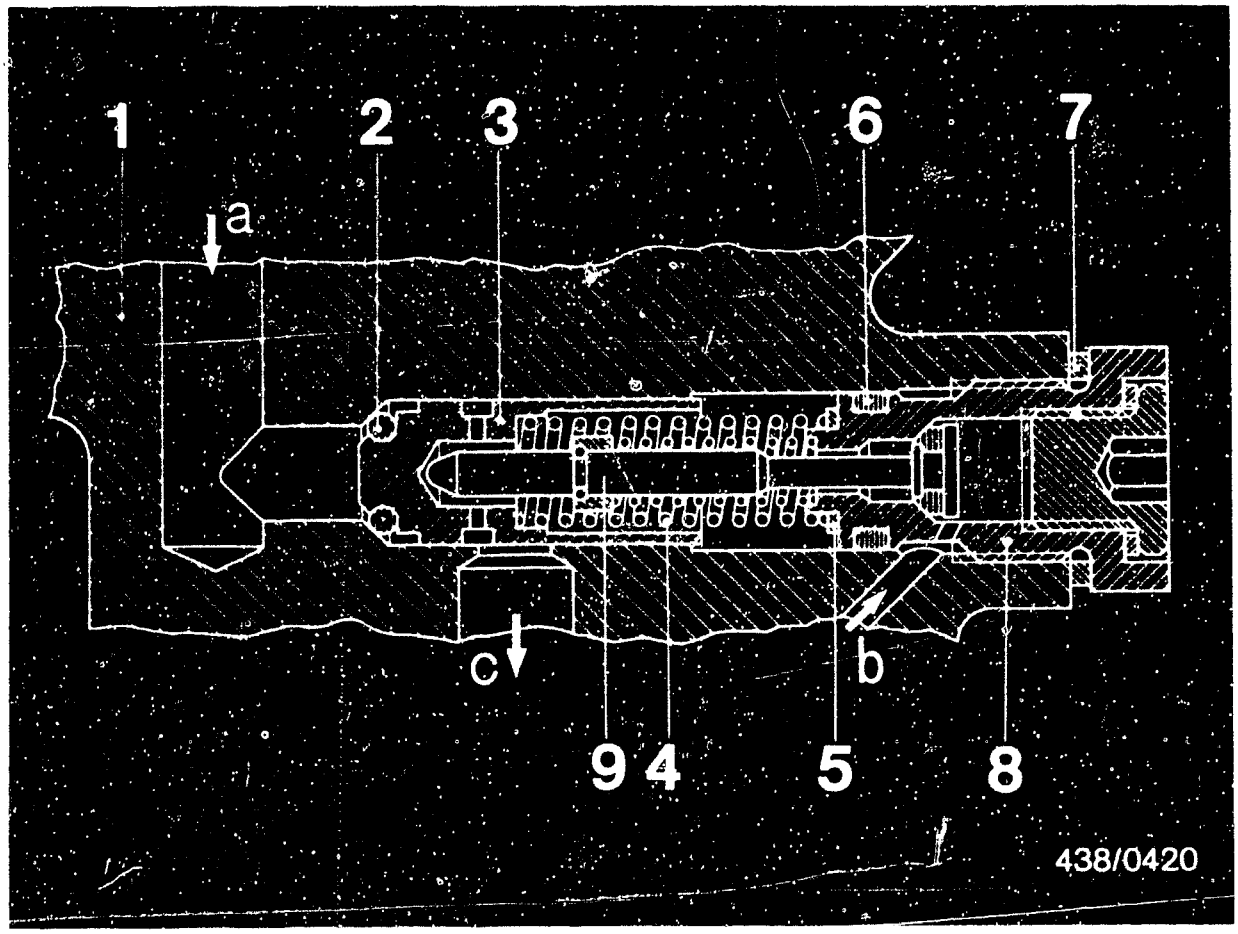
Leaking of the fuel-line-pressure damper is detected by an escape of fuel from the ventilation port (arrow).



a = Primary-pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

16.5 Possible causes of a defect in the control-pressure circuit:

The push valve (9) in the primary-pressure regulator has a leak.
Since the seal ring of the push valve is rigidly vulcanized onto the valve needle, the whole push valve (ready-assembled unit) must be changed.



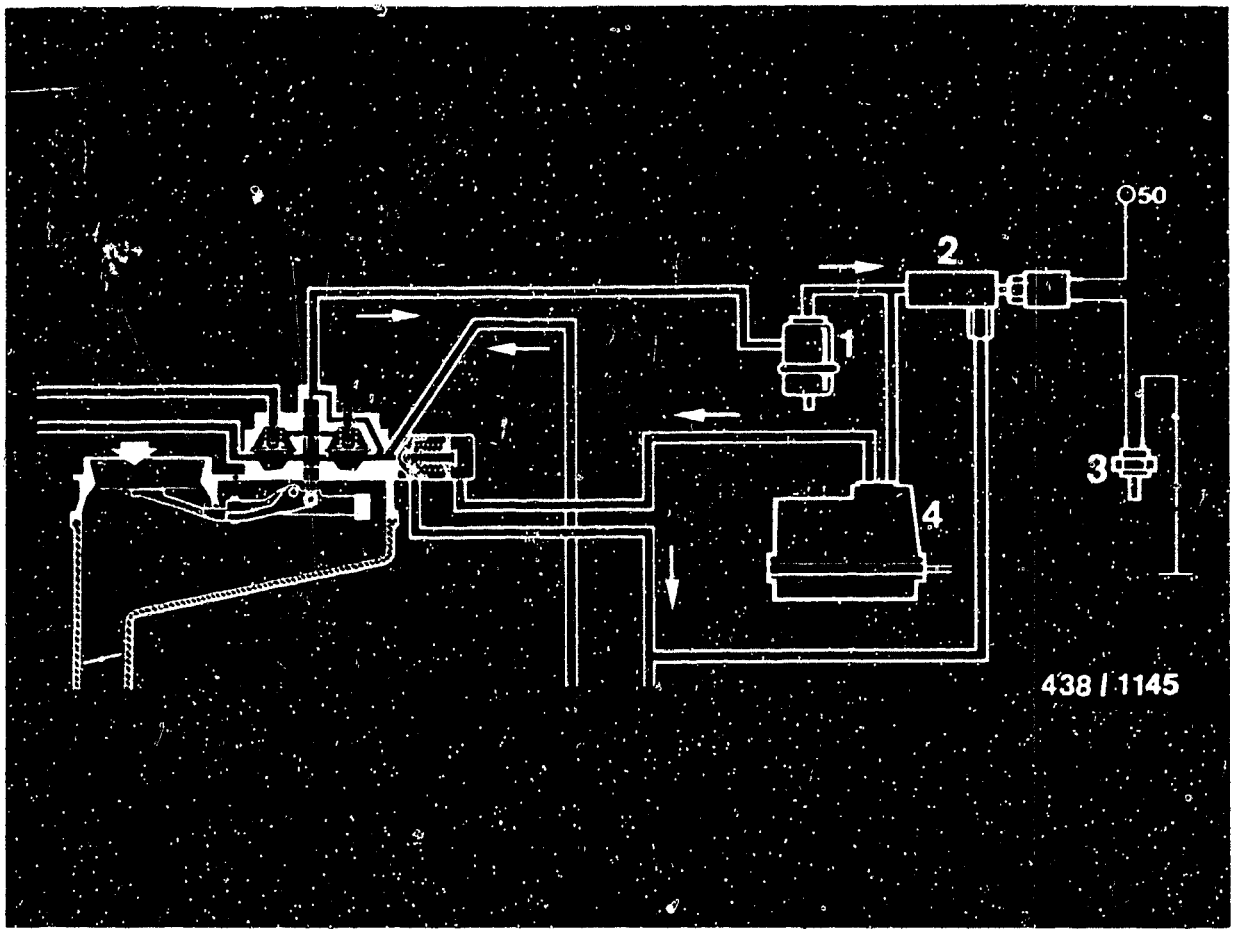
a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = O-ring
7 = Flat seal ring
8 = Screw plug
9 = Push valve

Clean the fuel distributor in the region of the primary-pressure regulator. Screw out the large screw plug (8) together with the complete push valve. Pay attention to control spring (4) and shims (5). Screw in new push valve using the number of shims (5) as when removed, new O-ring (6) and flat seal ring (7). Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure, test and setting values (gauge pressure)

Fuel distributor Part No. 0 438 100 027

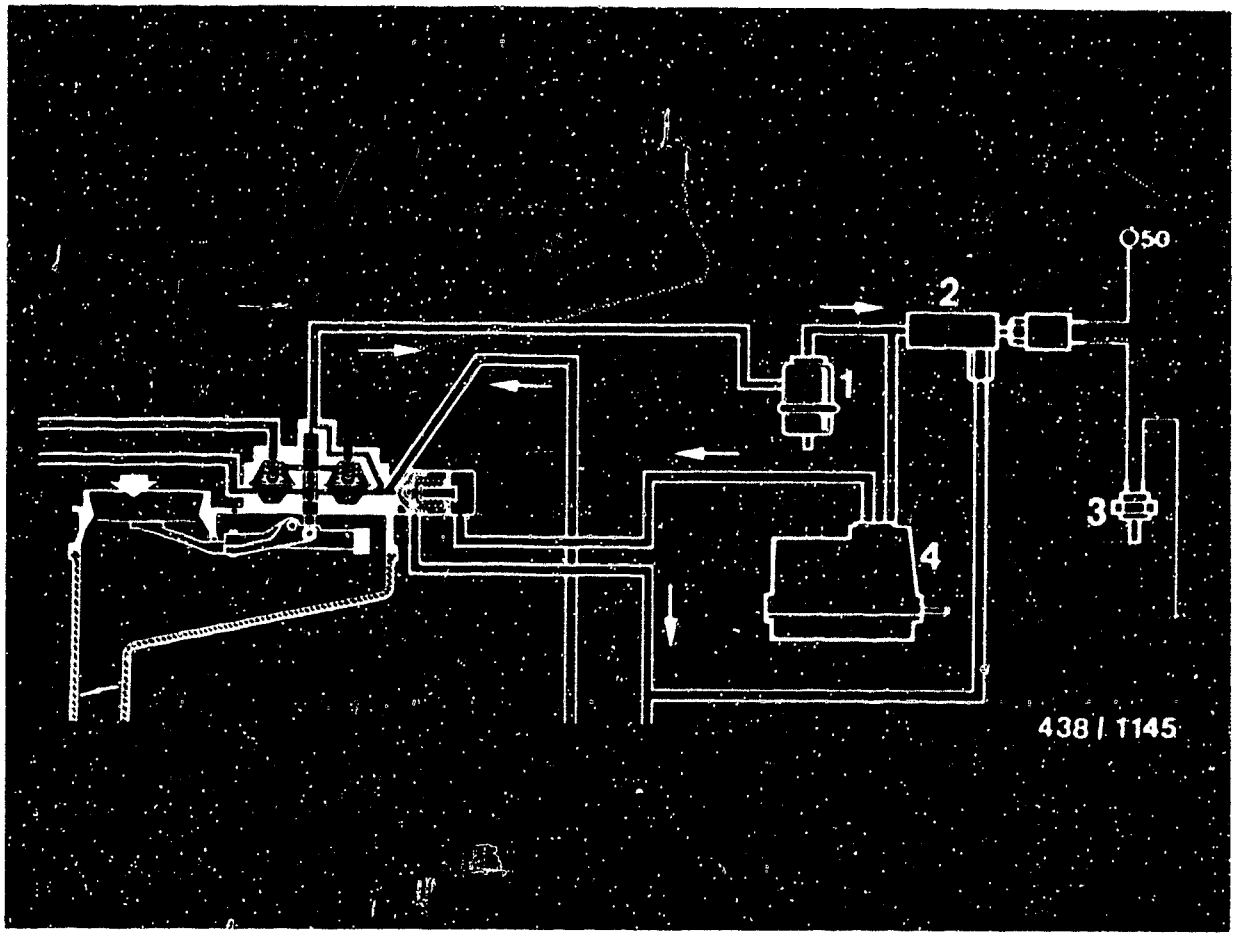
Checking value: 5,1...5,8 bar (5,2...5,9 kgf/cm²
Setting value : 5,3...5,5 bar (5,4...5,6 kgf/cm²)



1 = Fuel-line-pressure damper
2 = Control-pressure-reduction valve
3 = Thermo-switch
4 = Warm-up regulator

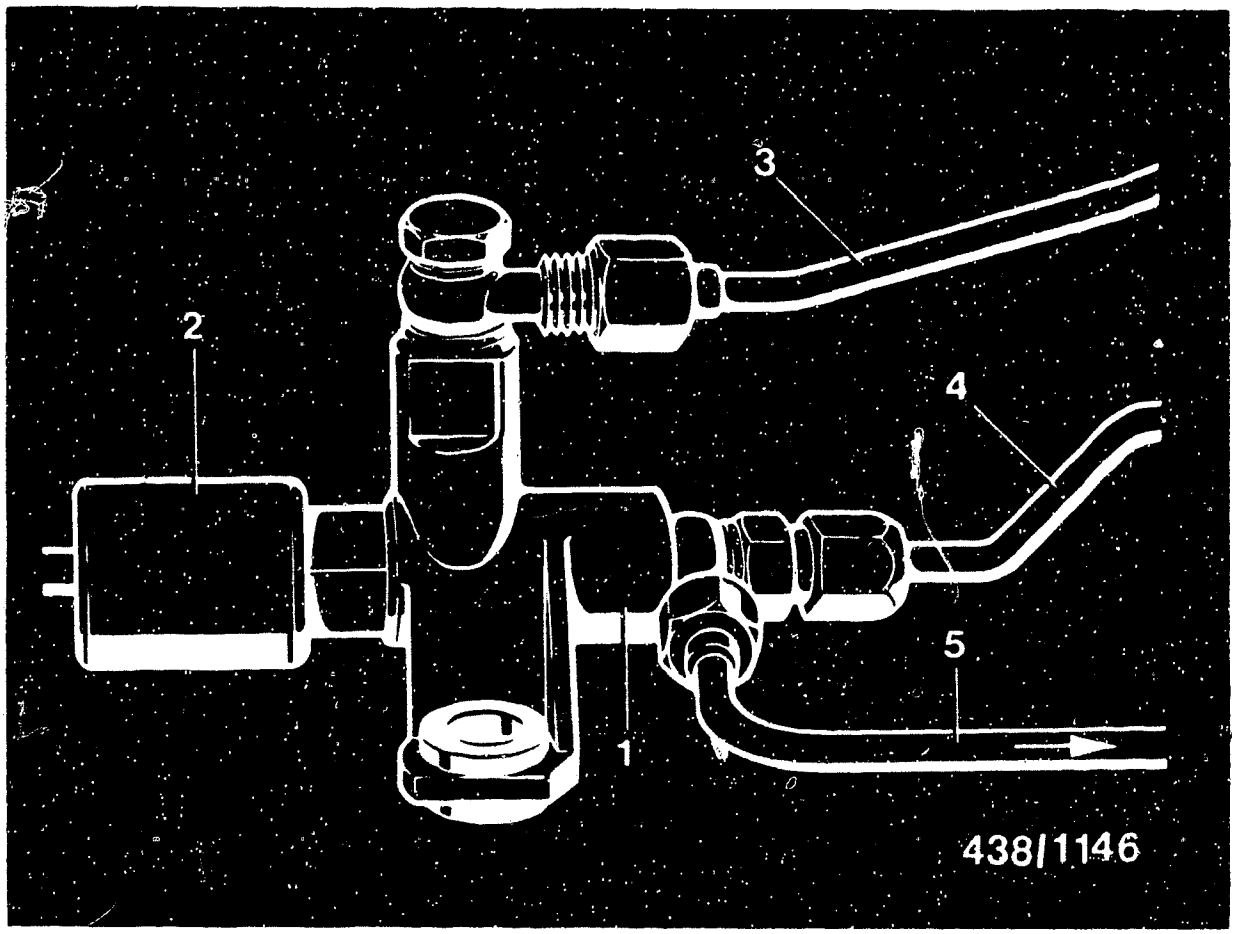
Further possible cause of leaks in the control-pressure circuit:

- Control-pressure-reduction valve leaking.



Note: The additional device for reducing the control pressure serves to improve the hot-starting performance of the Porsche 928/928 S and is installed as standard as of 18.1.1981. For the same reasons, this additional device is also installed in some cases in earlier vehicles by Porsche workshops.

The valve housing with solenoid-operated valve (not made by Bosch) is mounted by means of a bracket on the flange of the intake port of cylinder 3 and is connected hydraulically in parallel with the warm-up regulator.
Electrically, the valve is energized by terminal 50 and a thermo-switch (switching point 35°C).



1 = Control-pressure-reduction valve
2 = Electromagnet
3 = Fuel line to collective return line
4 = Fuel line from fuel distributor
5 = Fuel line to warm-up regulator

Leak test on pressure-reduction valve:

Unscrew fuel line 3 on valve housing and seal connection bore with screw plug M 8 x 1. Likewise seal inlet union of fuel line with plug.

Repeat leak test on control-pressure circuit.

Test specifications:

All models worldwide (excluding USA):
(fuel accumulator
0 438 170 026)

Minimum pressure after
10 minutes: 2.7 bar (2.8 kgf/cm²)

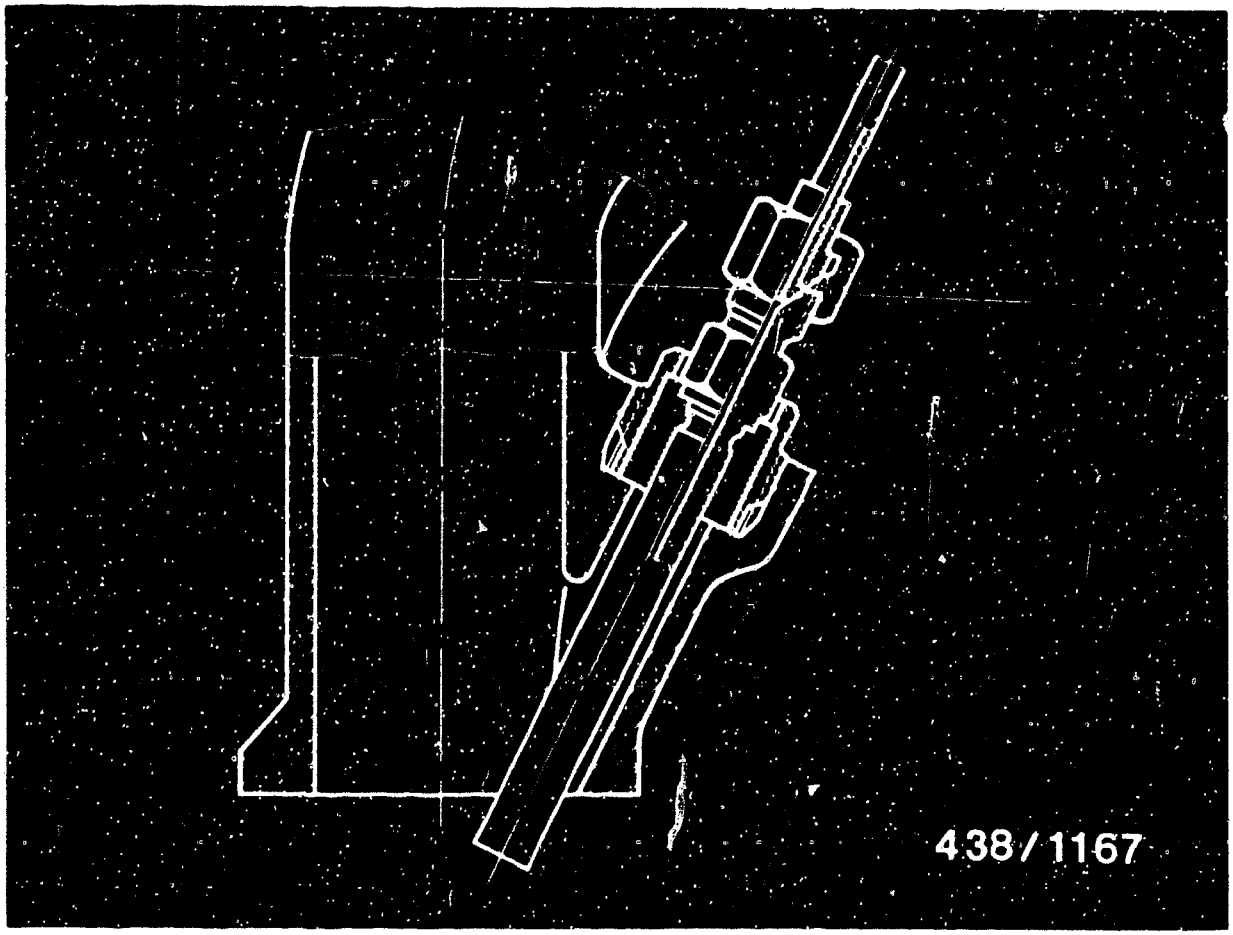
Minimum pressure after
20 minutes: 2.6 bar (2.7 kgf/cm²)

78/79 model USA:
(fuel accumulator)
0 438 170 022; ... 025)

Minimum pressure after
10 minutes: 2.0 bar (2.1 kgf/cm²)

Minimum pressure after
20 minutes: 1.7 bar (1.8 kgf/cm²)

If leaking, the control-pressure-reduction valve must be replaced. The new part is obtainable from your Porsche agent.



17. Testing the injection valves

Notes on installing and removing the injection valves:

The injection valves are held by a specially shaped rubber block which is pressed into a screw sleeve.

The screw sleeve is screwed in and out by turning the fixed hexagonal section of the injection valve.

17.1 Test equipment and test media

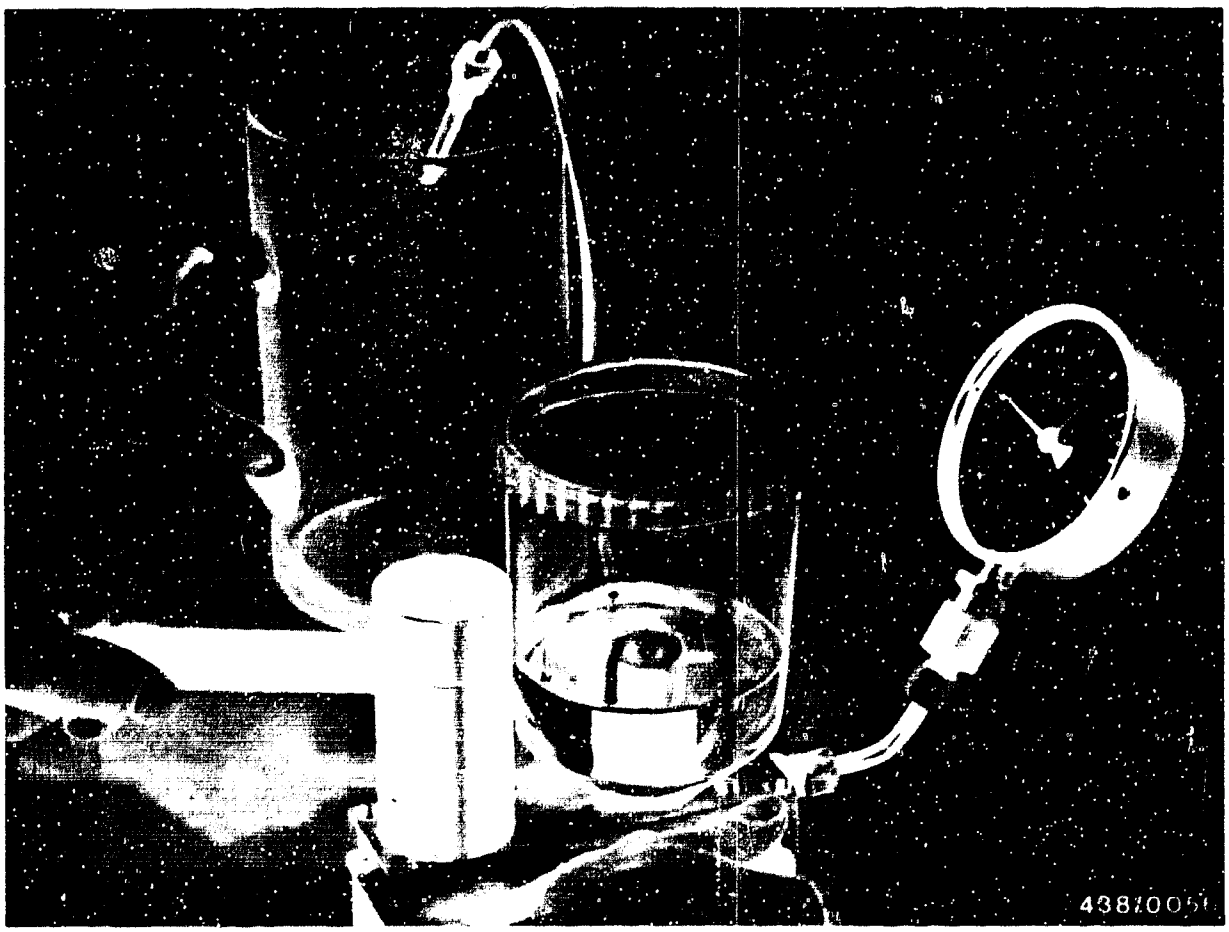
The following testing specification refers to valve testers KDJE-P 400 (previously KDJE 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch, Part No. VS 14 942-CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:

Firma
Oskar Gnamm GmbH
D-7531 Kämfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

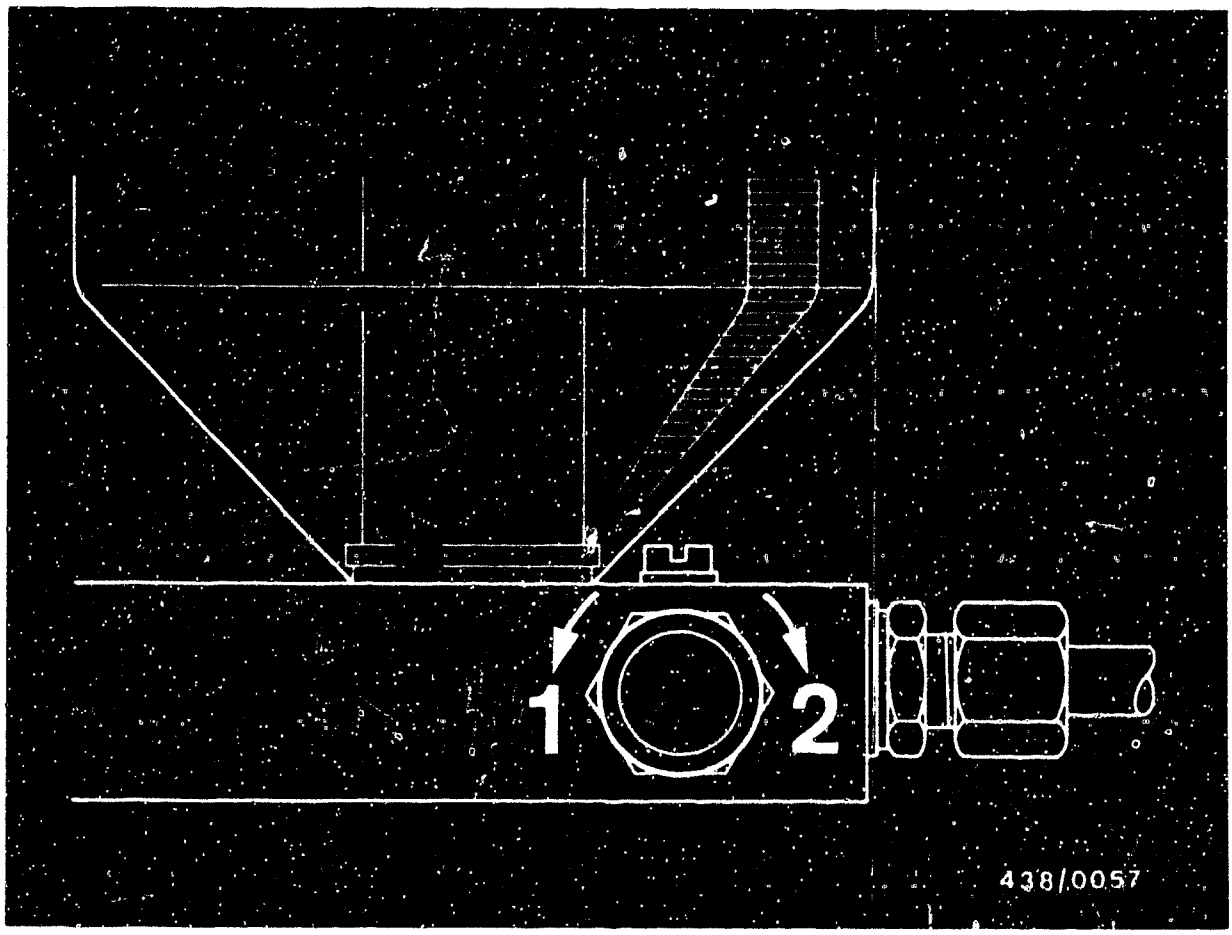


17.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.

17.3 Checking for dirt

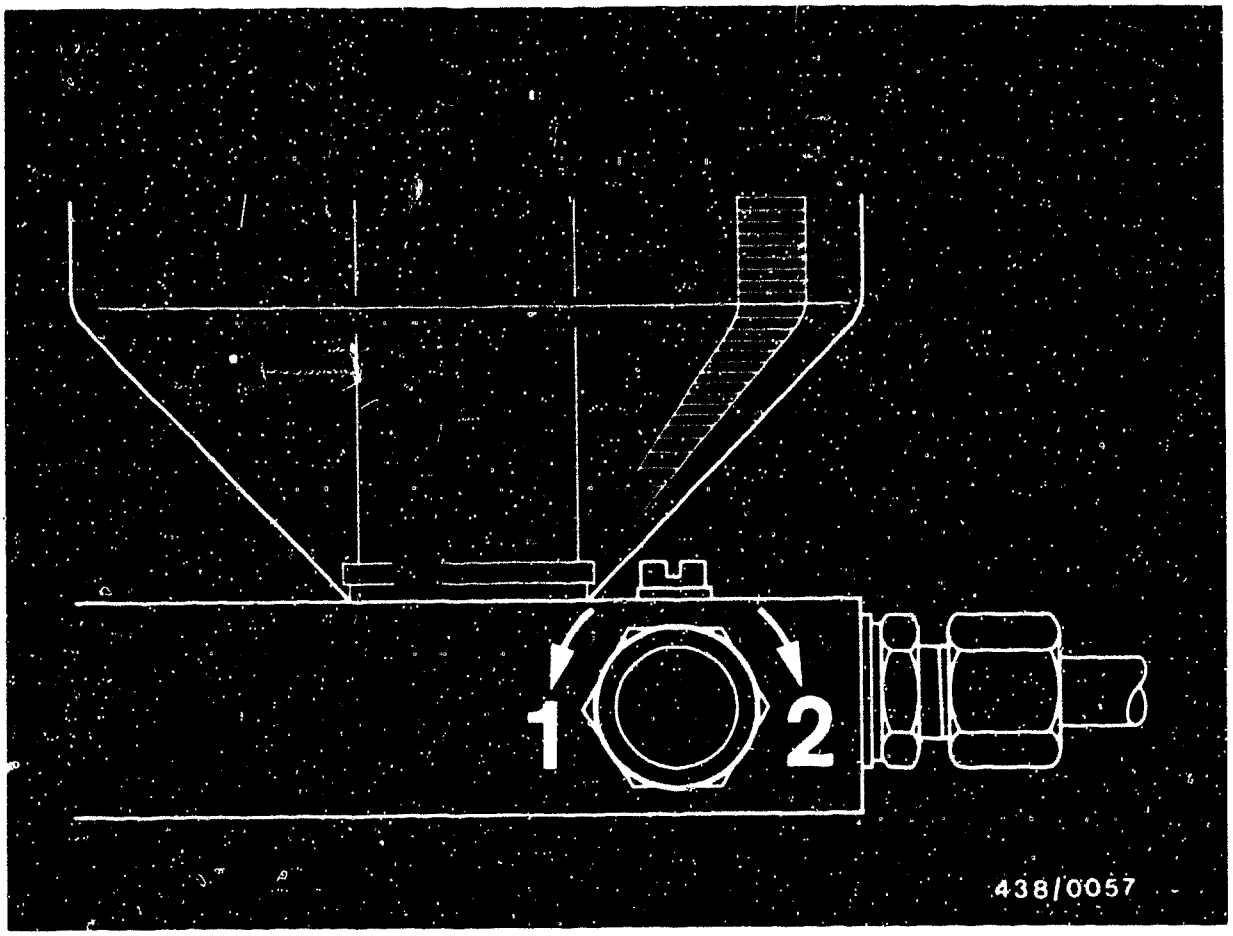
Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Close

17.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (gauge pressure)
0 437 502 012	3.0...4.1 bar (3.1...4.2kgf/cm²)

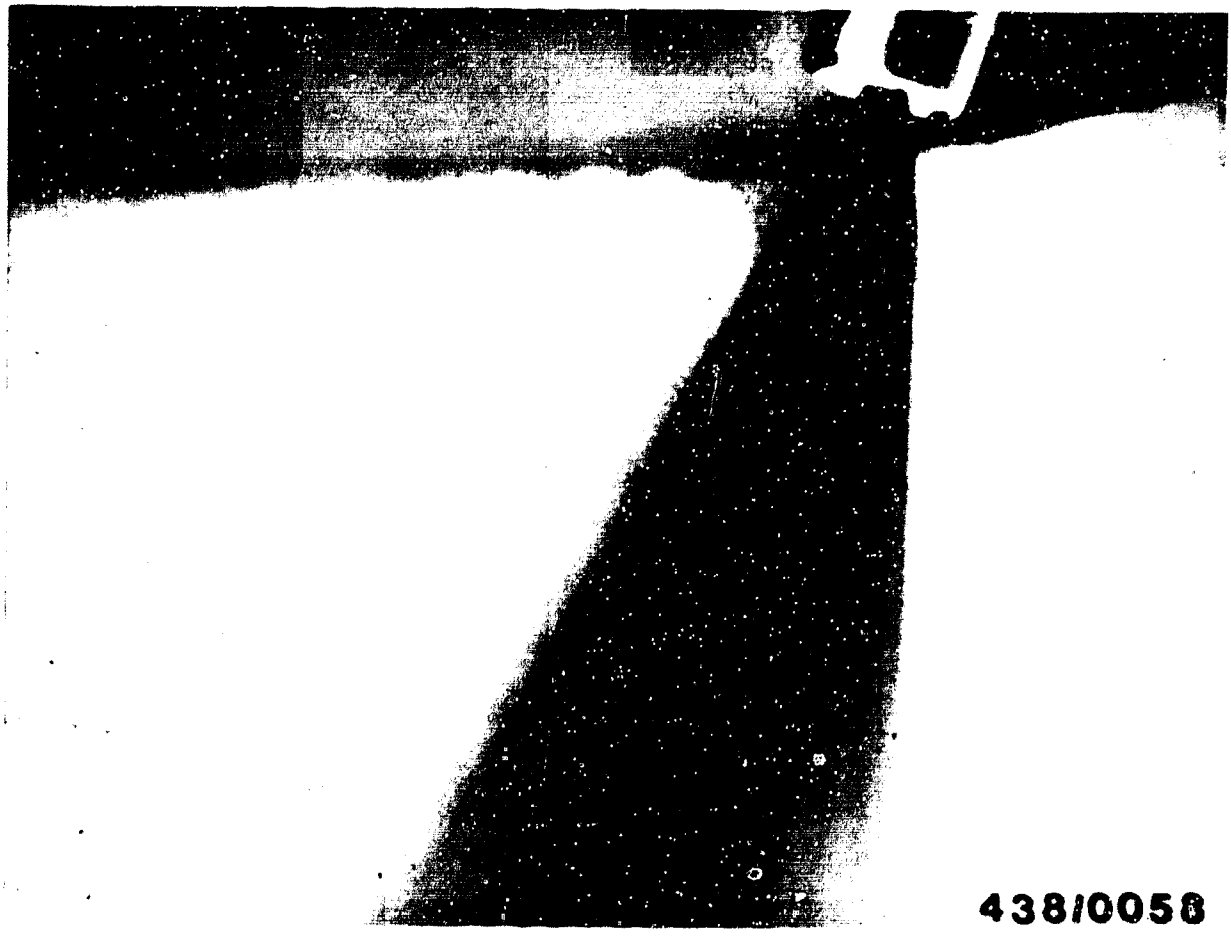


With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).

If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.3 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.



438/0058

17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.

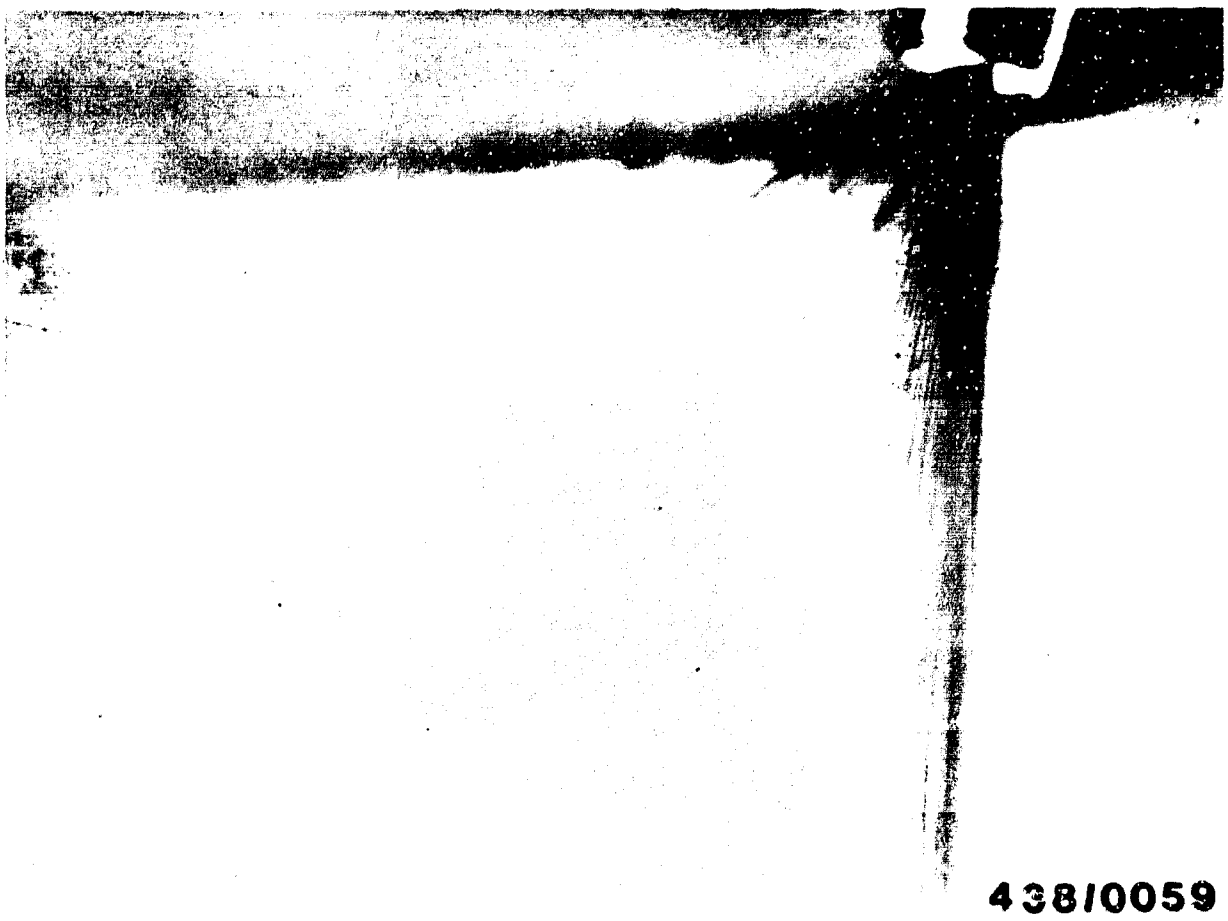
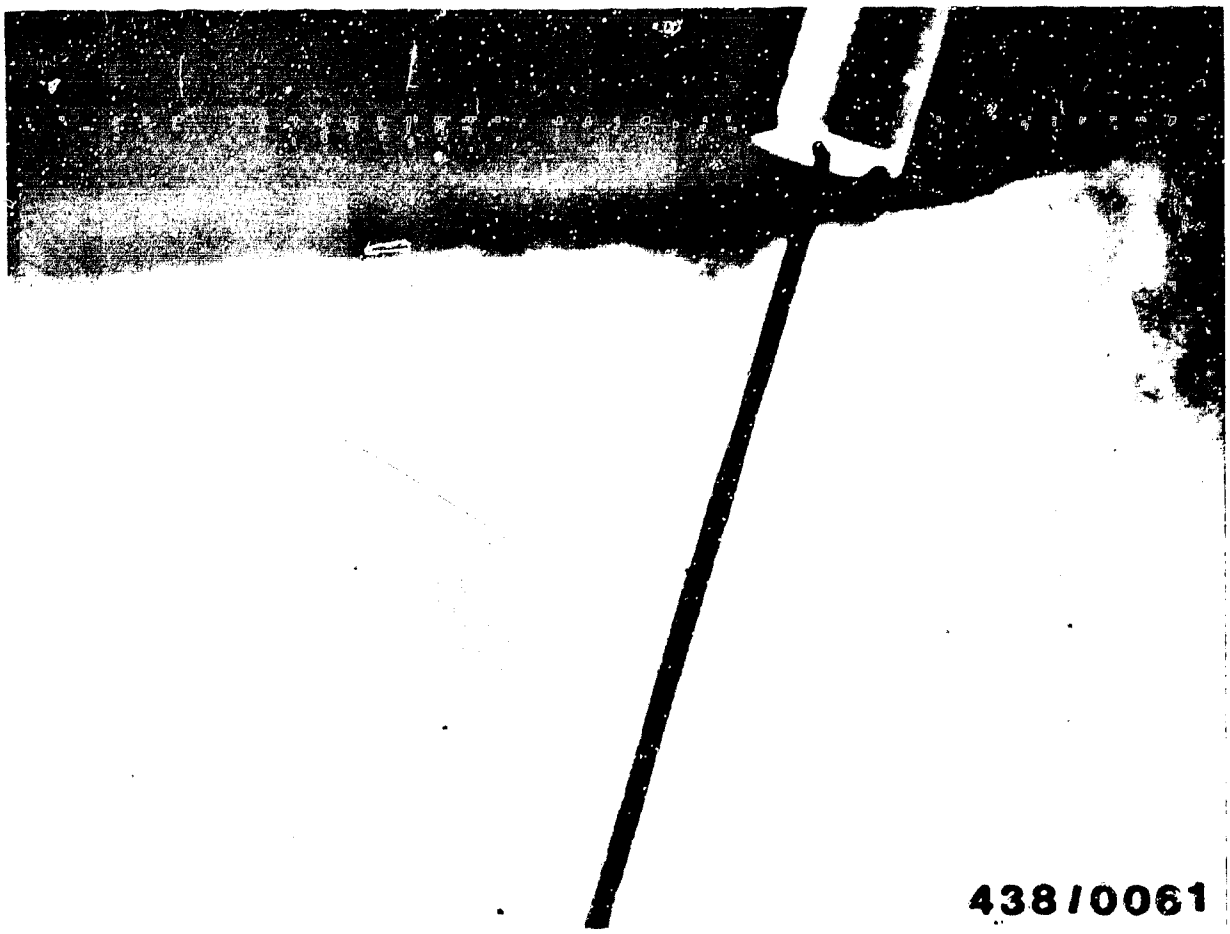


Illustration shows single-sided but nevertheless good spray formation.

438/0060

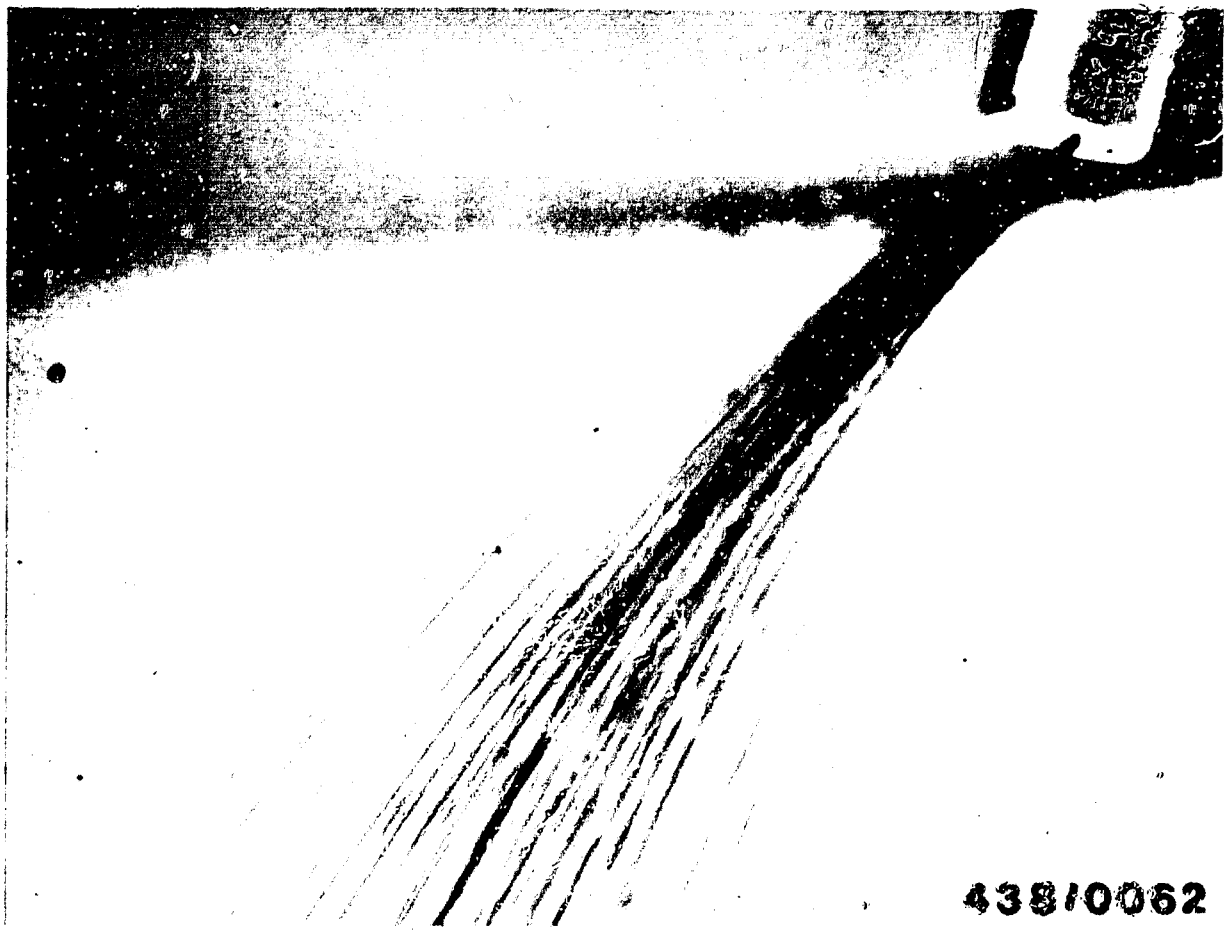
Poor spray formation; replace injection valves.

Illustration shows drop formation.



Poor spray formation; replace injection valves.

Illustration shows "cord" spray.

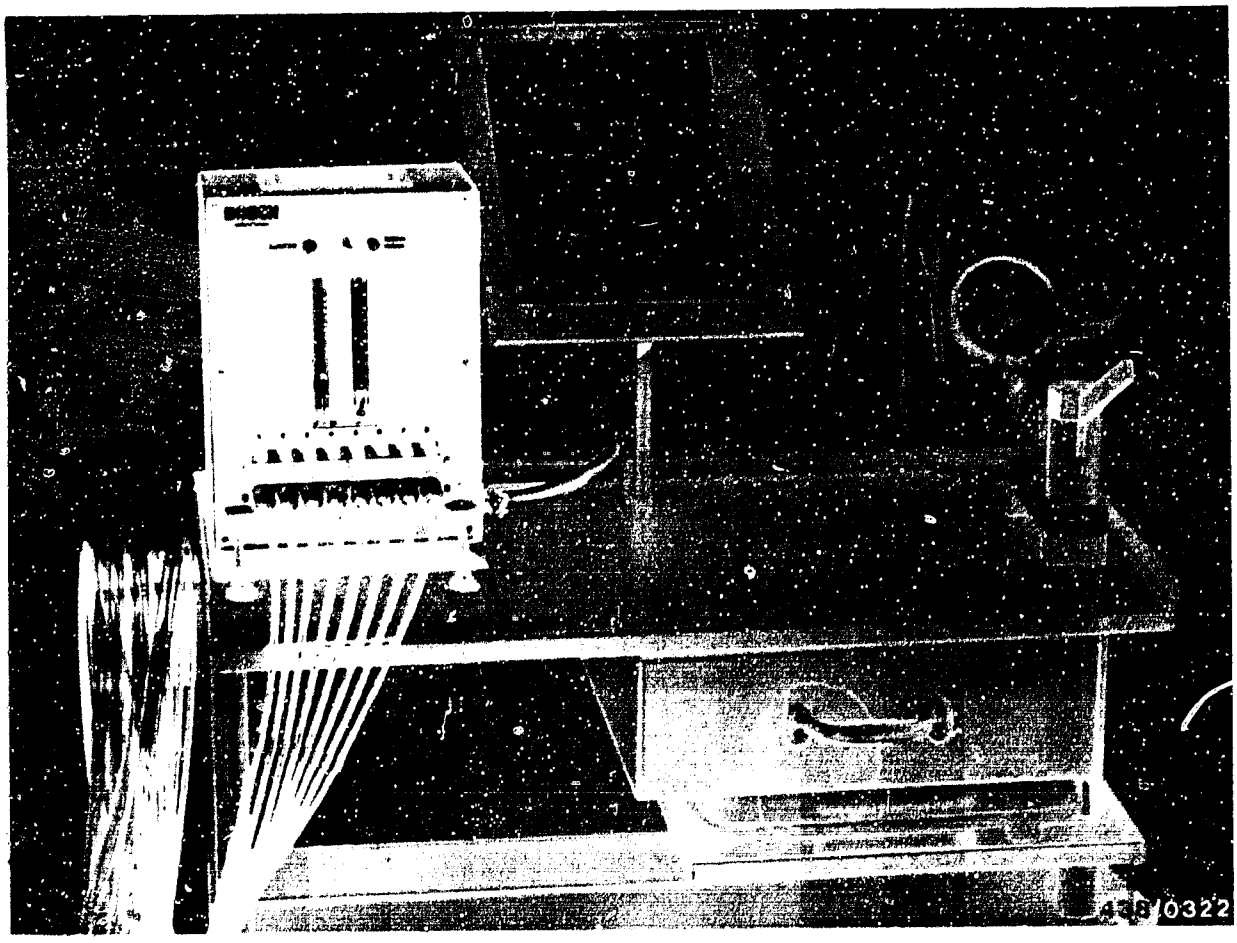


Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates H 21.

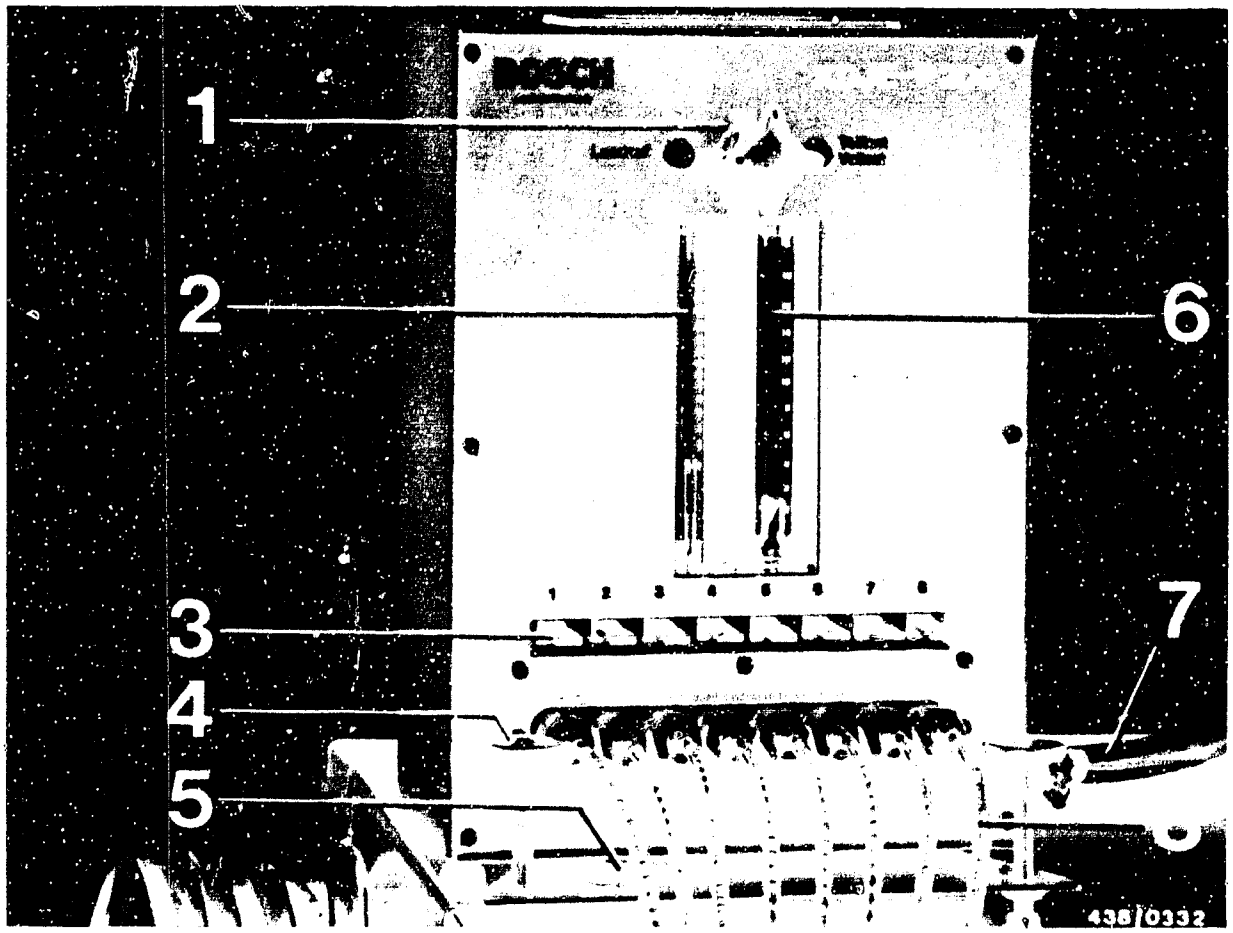


18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load.

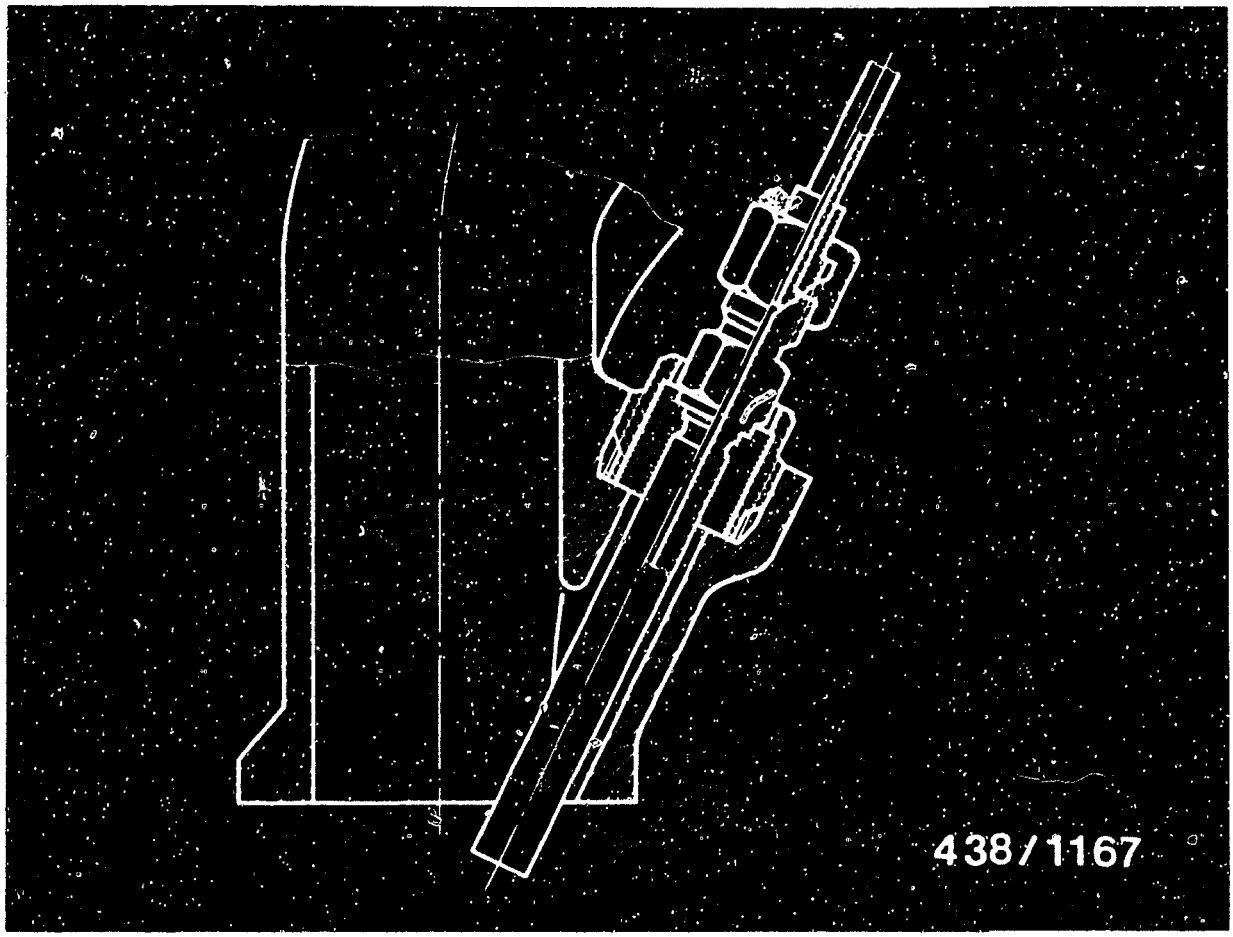
The particular rotameter tube to be used is connected by means of the 3-way stopcock.

Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.

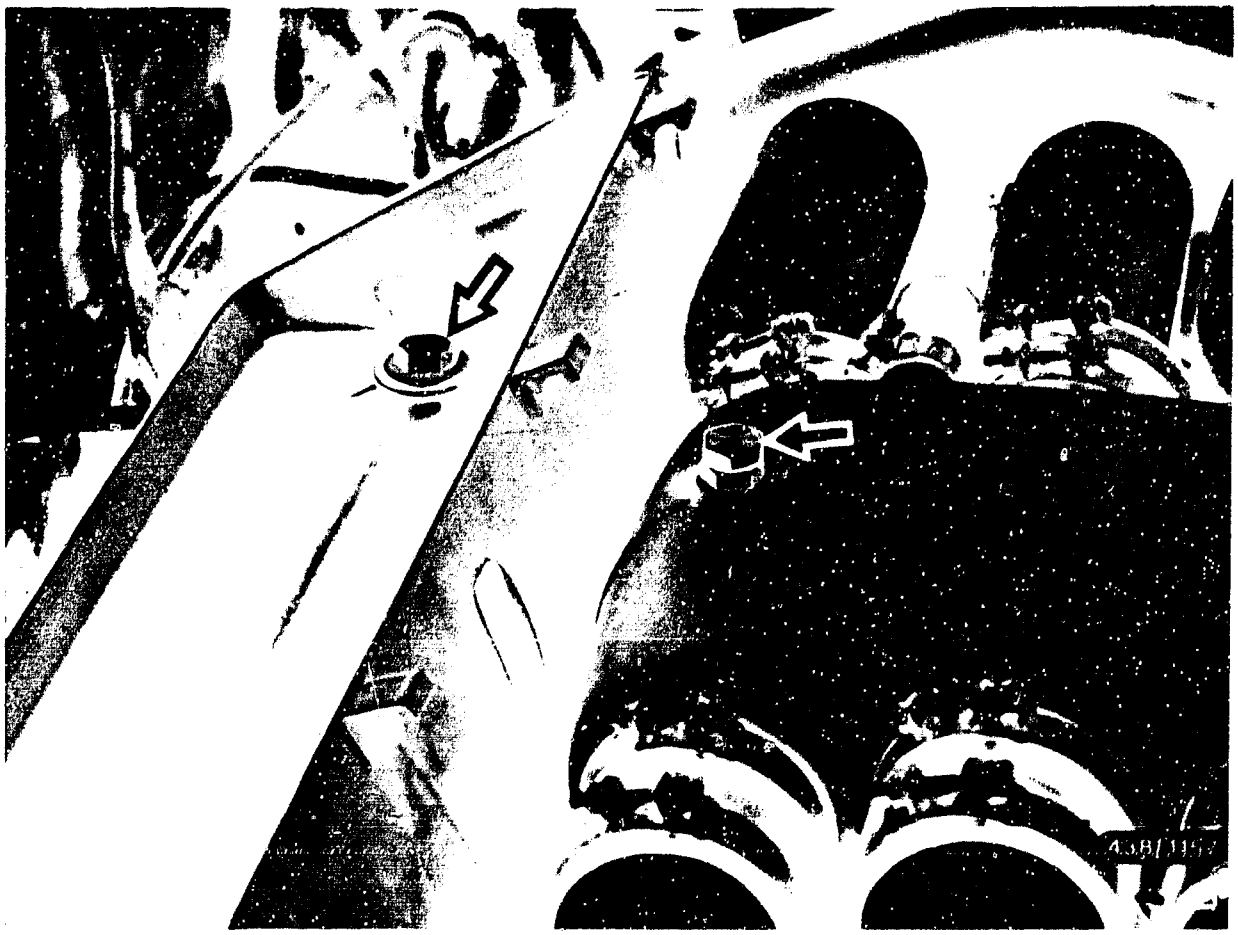


18.3 Setting up and connecting the tester for delivered quantity comparison:

Remove the injection valves for testing. Note the following information:

The injection valves are held by a specially shaped rubber block which is pressed into a screw sleeve.

The screw sleeve is screwed in and out by turning the fixed hexagonal section of the injection valve.

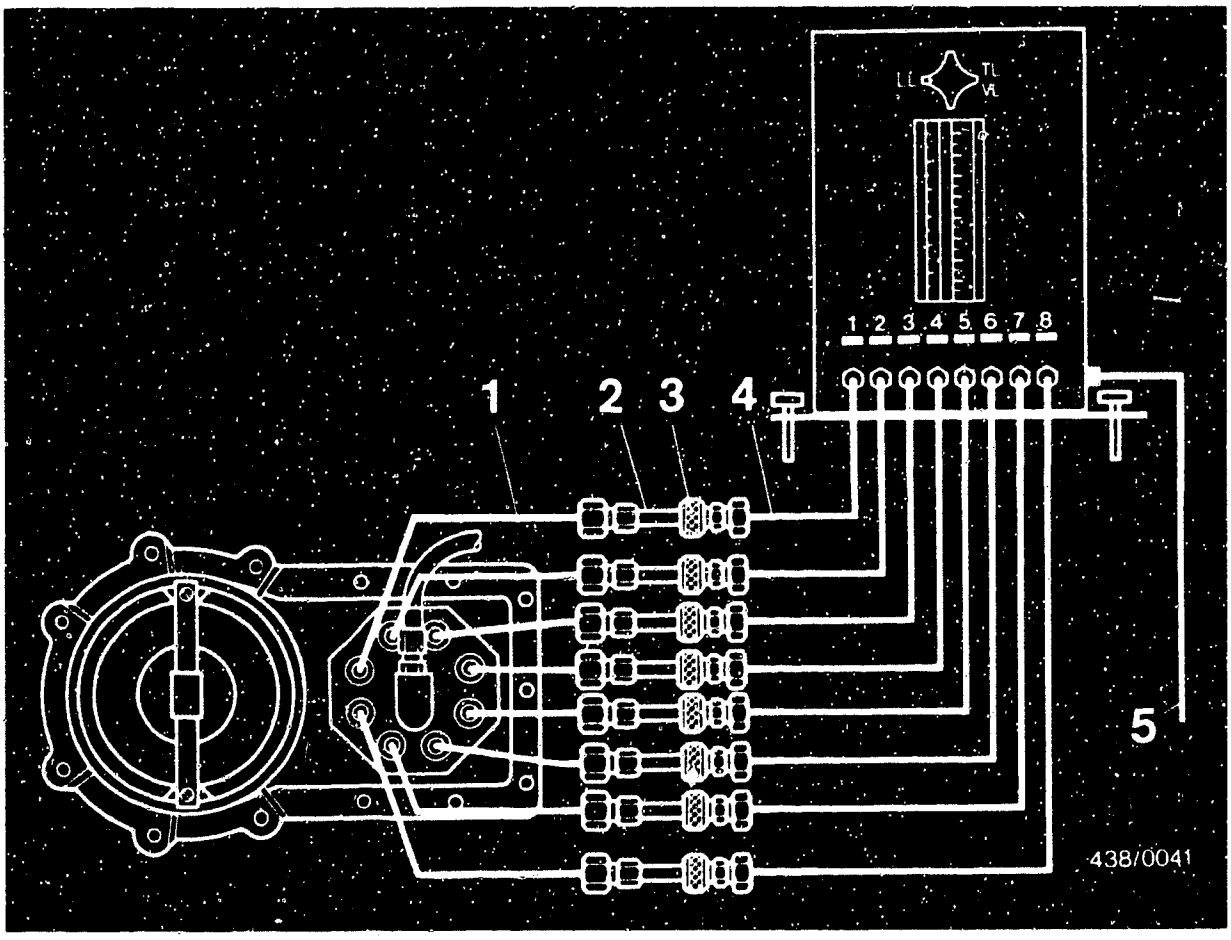


To make the mixture-control unit accessible, remove the complete air filter:

Remove both intake-air hoses.

Remove the air filter top part (unhook 4 clamping bands).

Unscrew the pressure screw in the intake manifold as well as the fastening screws in the air-filter housing (arrow), and withdraw filter housing to the right.



1 = Adapter connection hoses from line set KDJE-P200/25
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

So that the rigid fuel-injection tubing is not bent too much, the tester for delivered quantity comparison is connected using the adapter connection hoses KDJE-P200/25.

Remove the injection valves completely.

Unscrew the fuel-injection tubing from the fuel distributor and connect the adapter connection hoses instead.

Screw the injection valves onto the adapter connection hoses.

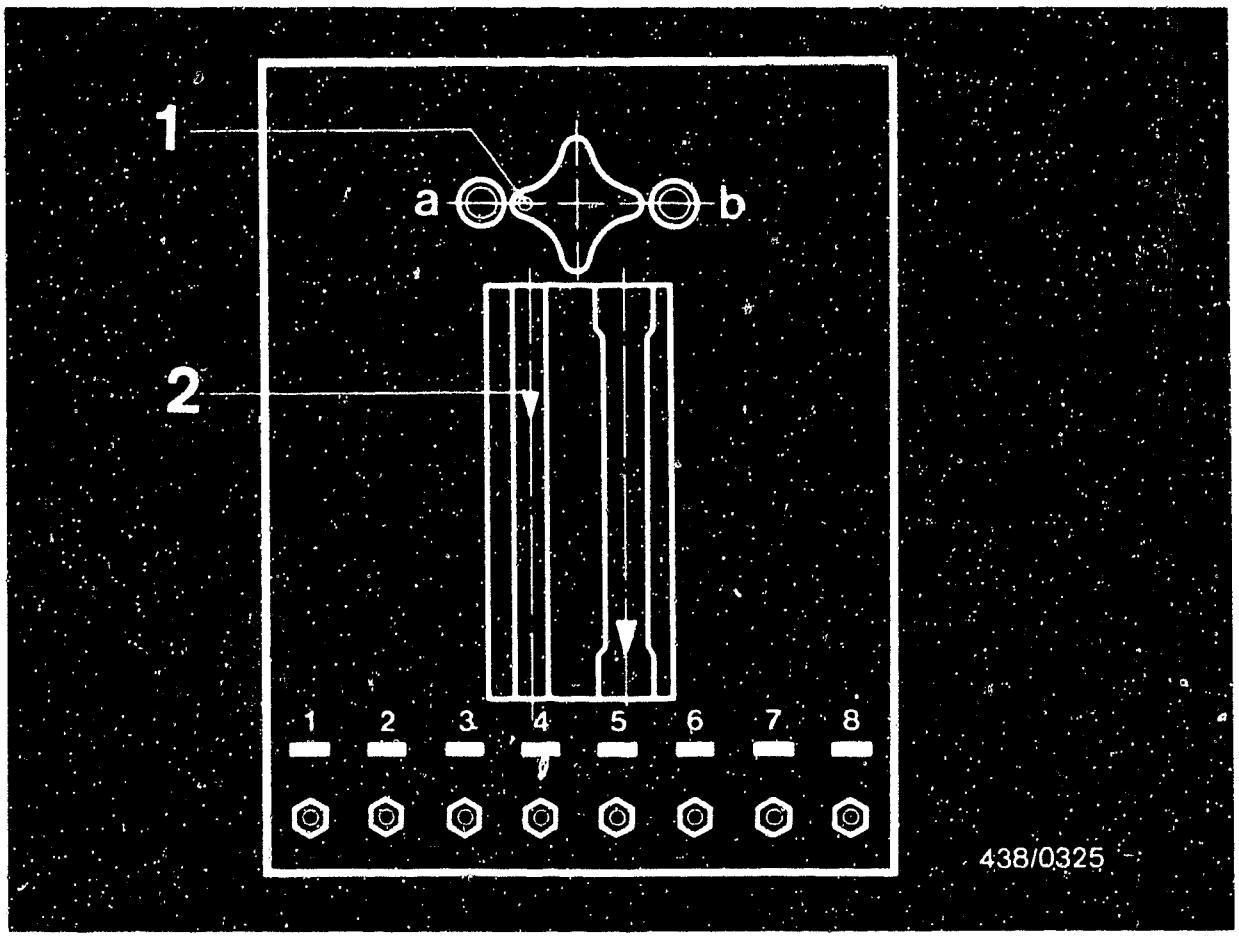
Clean the injection valves with a rag and insert injection valves into the automatic connectors of the first four tester hoses.

Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are opened fully.

Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the electric plugs from the warm-up regulator and the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Press down the air-flow sensor plate to the stop.
Press the keys on the 3-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.

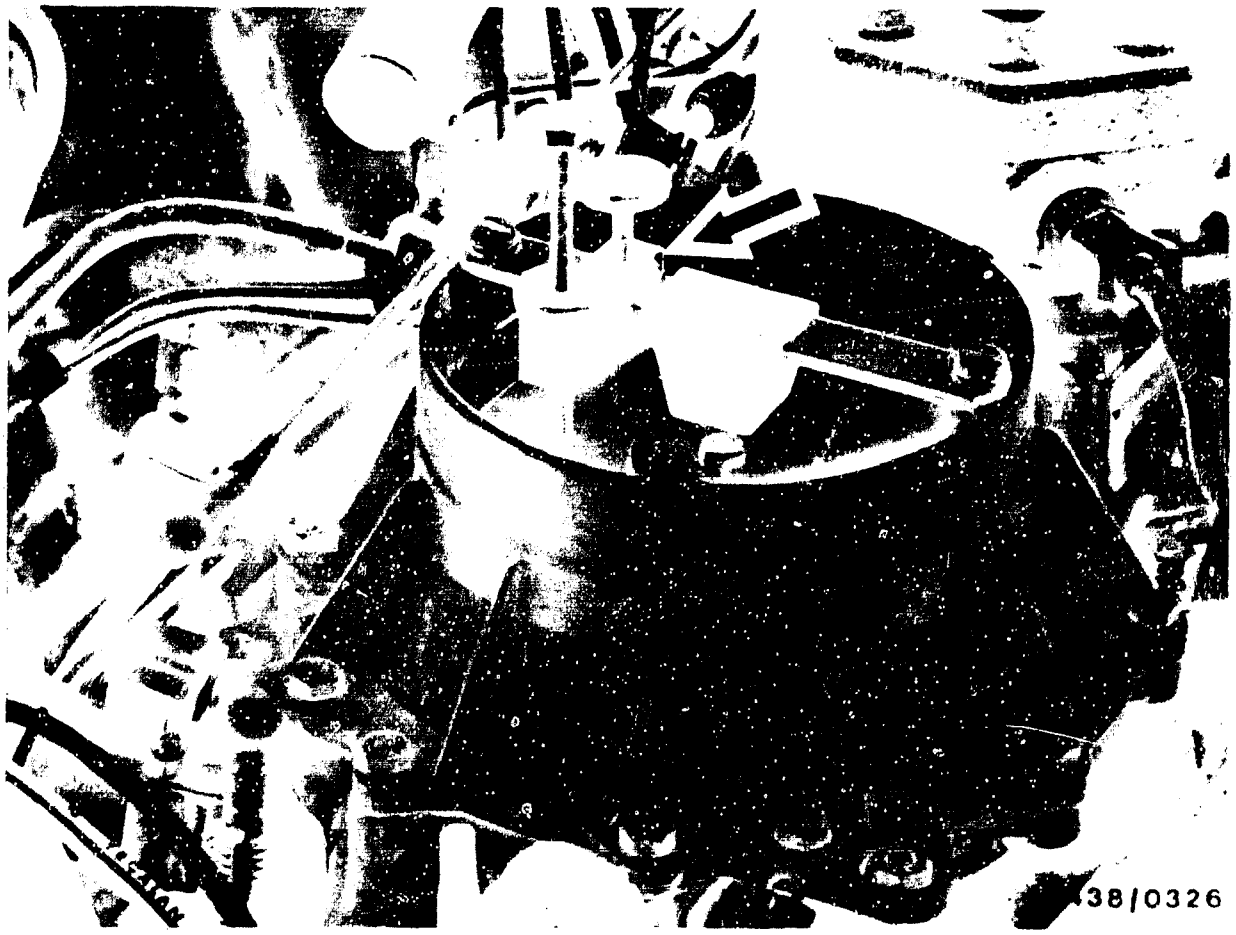


1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

18.5 Testing

The flow comparison measurement is made in the idle, part-load and full-load ranges.
The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using the setting device KDJE 7456.

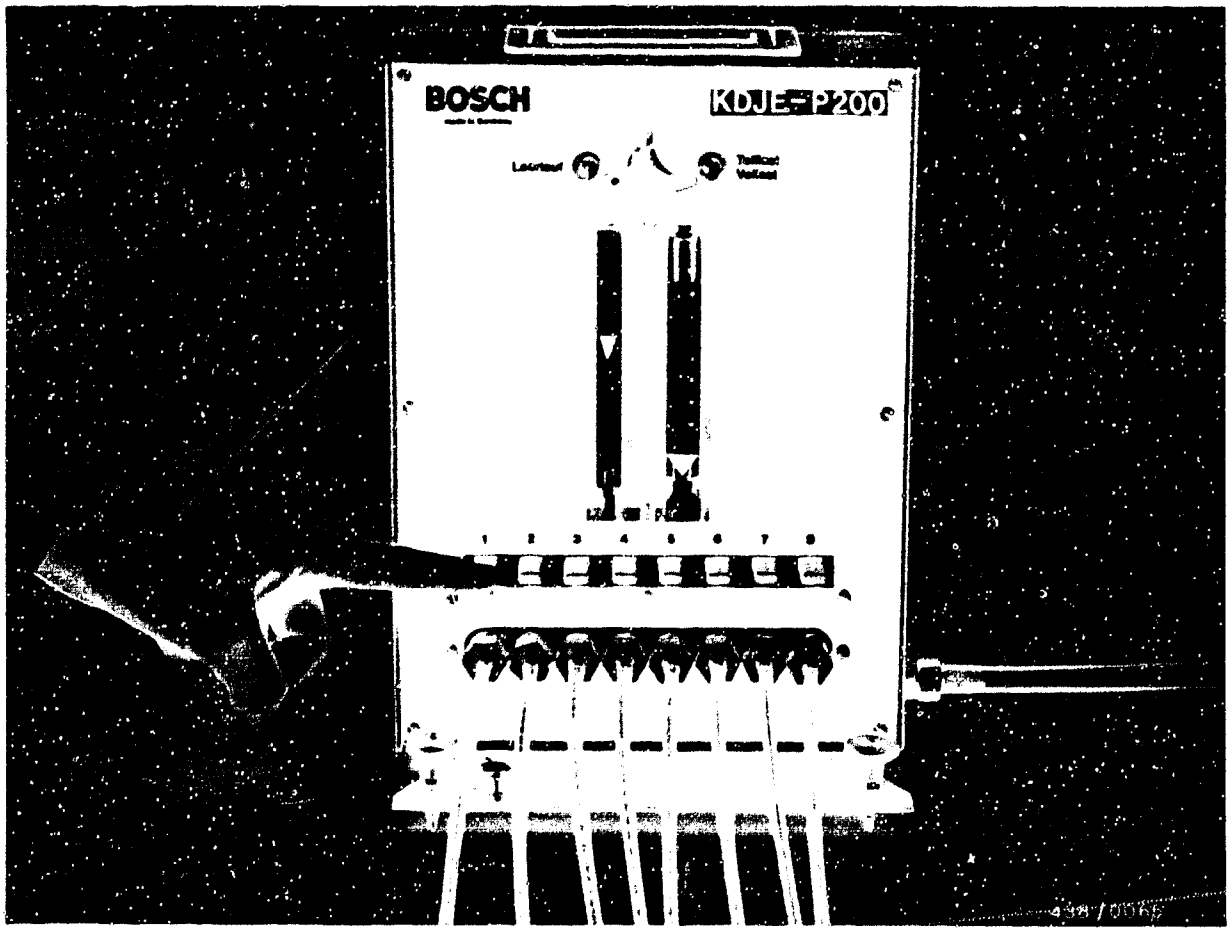
With the adjusting screw initially screwed all the way out, the setting device is clamped onto the stop bracket of the air funnel (arrow).
Adjust the position of the air-flow sensor plate using the adjusting screw.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.

Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "setpoint" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

18.6 Test specifications

	Set point (cm^3/min)	Max. permissible fuel delivery (cm^3/min)
Idle	6.0	6.8
Part load	40.0	44.0
Full load	145.0	160.0

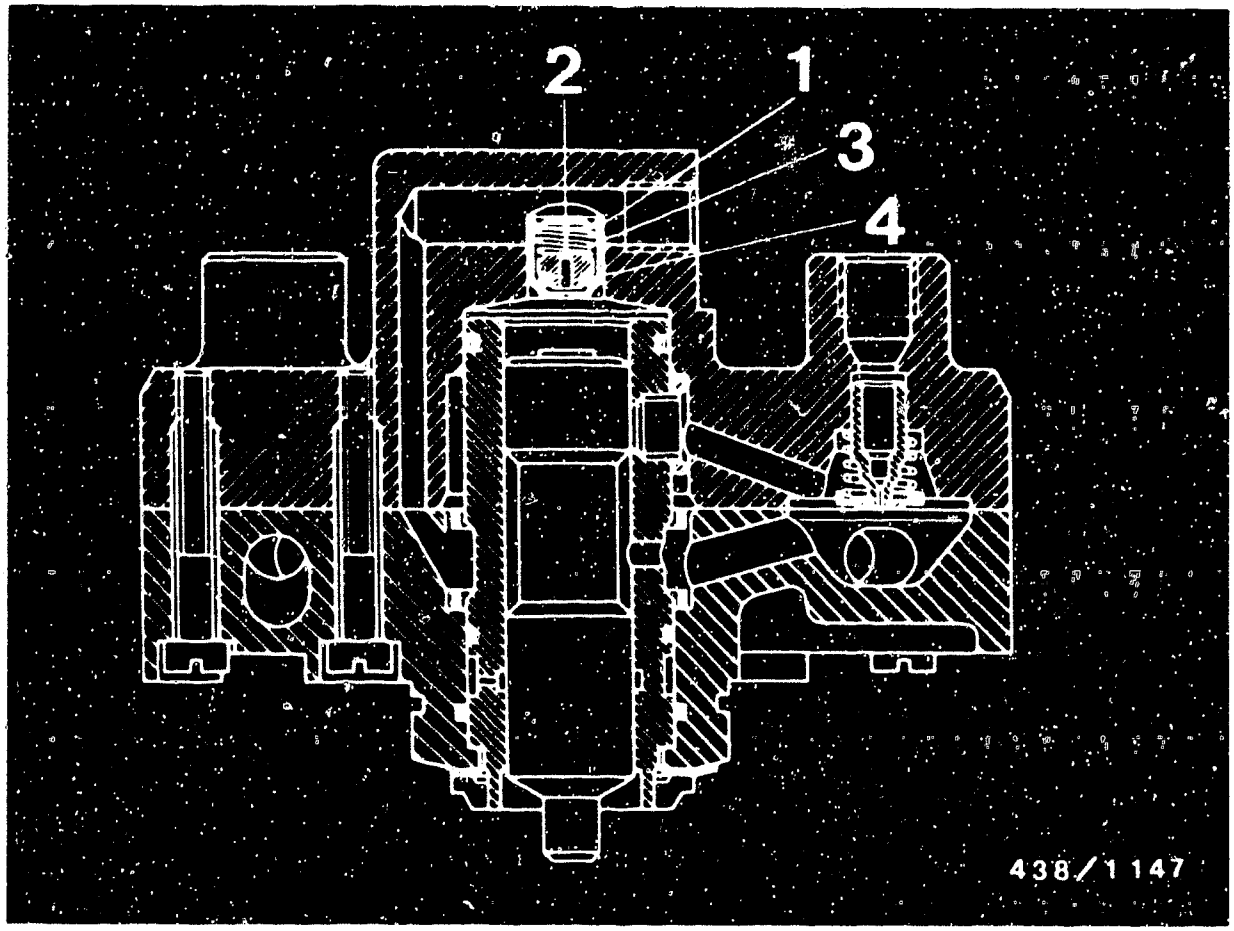
If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.



1 = Capsule valve
2 = Restriction bore
3 = Valve spring
4 = Valve piston with seal ring

Special information on replacing the fuel distributor:

As of the 1981 model year the Porsche models 928 and 928 S are equipped with a fuel distributor with capsule valve (instead of non-adjustable flow control valve) (see diagram).
This results in an improved transient response (throttle take-up), particularly during the warm-up phase.

In a service bulletin Porsche has informed its own service organization of the modification to the fuel distributor and has ordered that after stocks have been used up only the 1981 model fuel distributor (with capsule valve) is to be installed also in earlier vehicles (model years 1978 to 1980), should it be necessary to replace the fuel distributor.

We endorse this procedure for the Bosch After-Sales Service Organization.

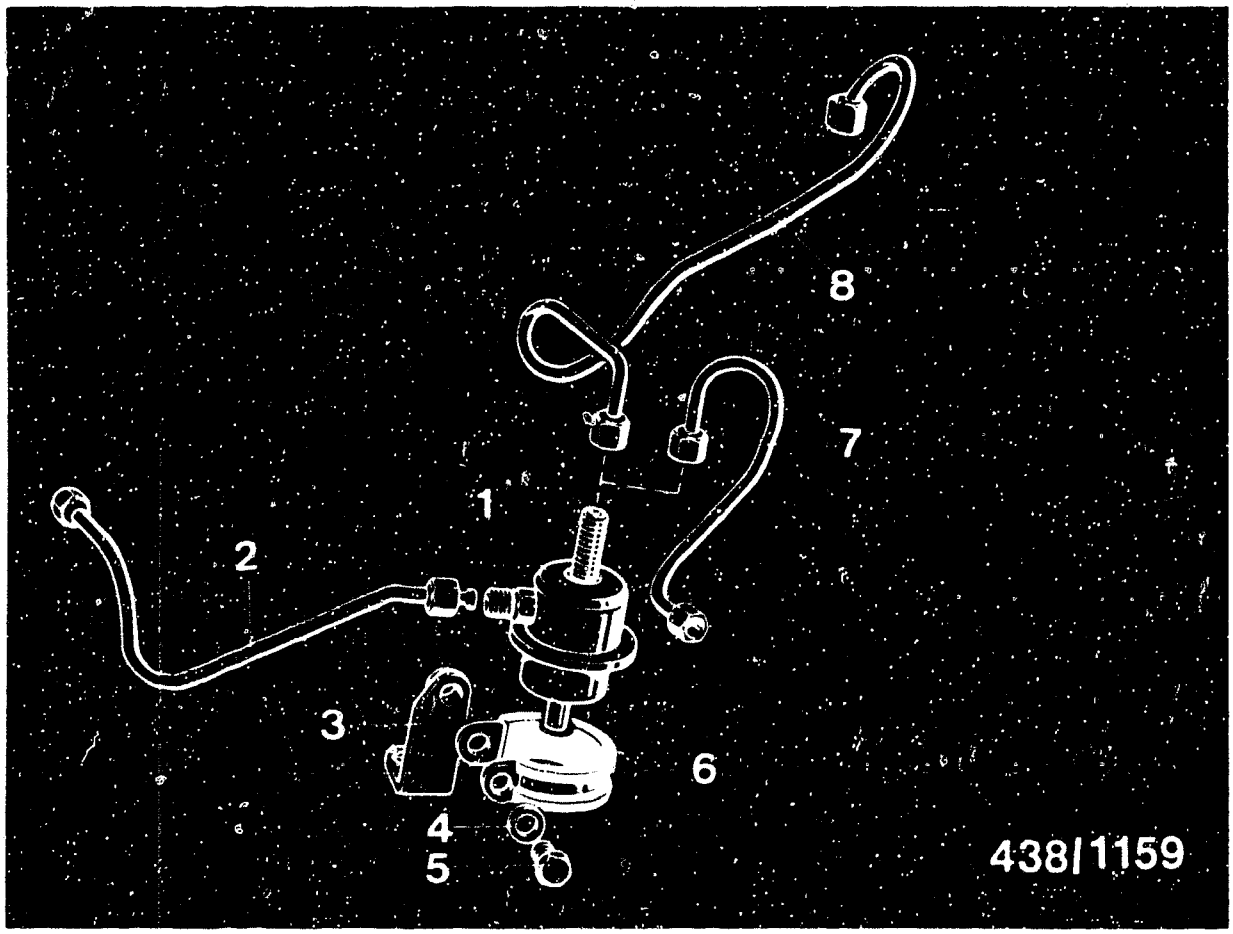
This modification to the fuel distributor was performed without changing the part number, but the respective version can be identified by the colour of the name-plate.

Fuel distributor part number: 0 438 100 027

Colour of nameplate:

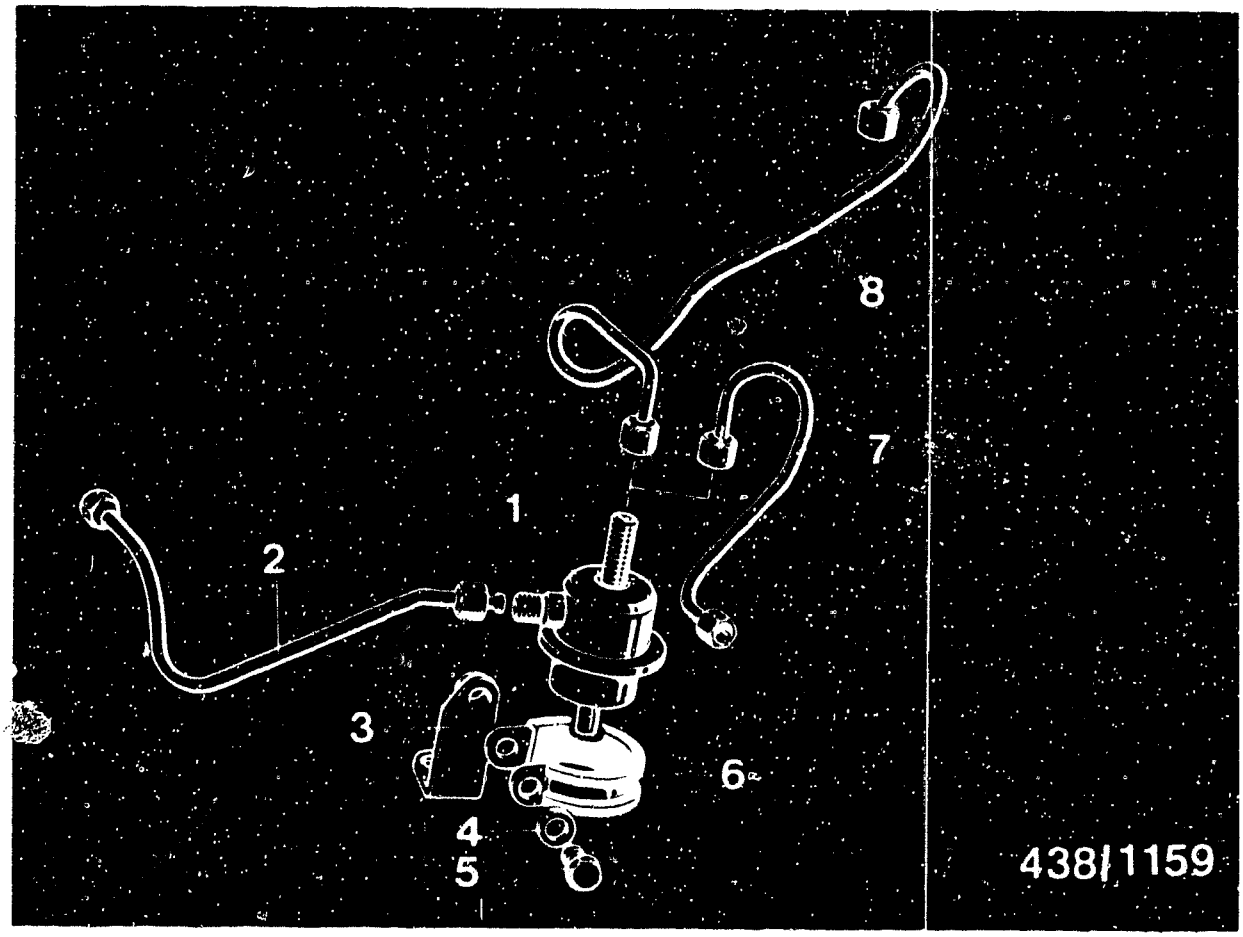
Fuel distributor with non-adjustable flow control valve, earlier version	red
Fuel distributor with capsule valve, as of 1981 model:	black/red

The introduction of the fuel distributor with capsule valve also required the installation of a fuel-line-pressure damper in the control-pressure line from the fuel distributor to the warm-up regulator. This is also absolutely essential if the new fuel distributor is retrofitted in earlier vehicles. The retrofitting of the fuel-line-pressure damper is described on the following coordinates.



Installing the fuel-line-pressure damper:

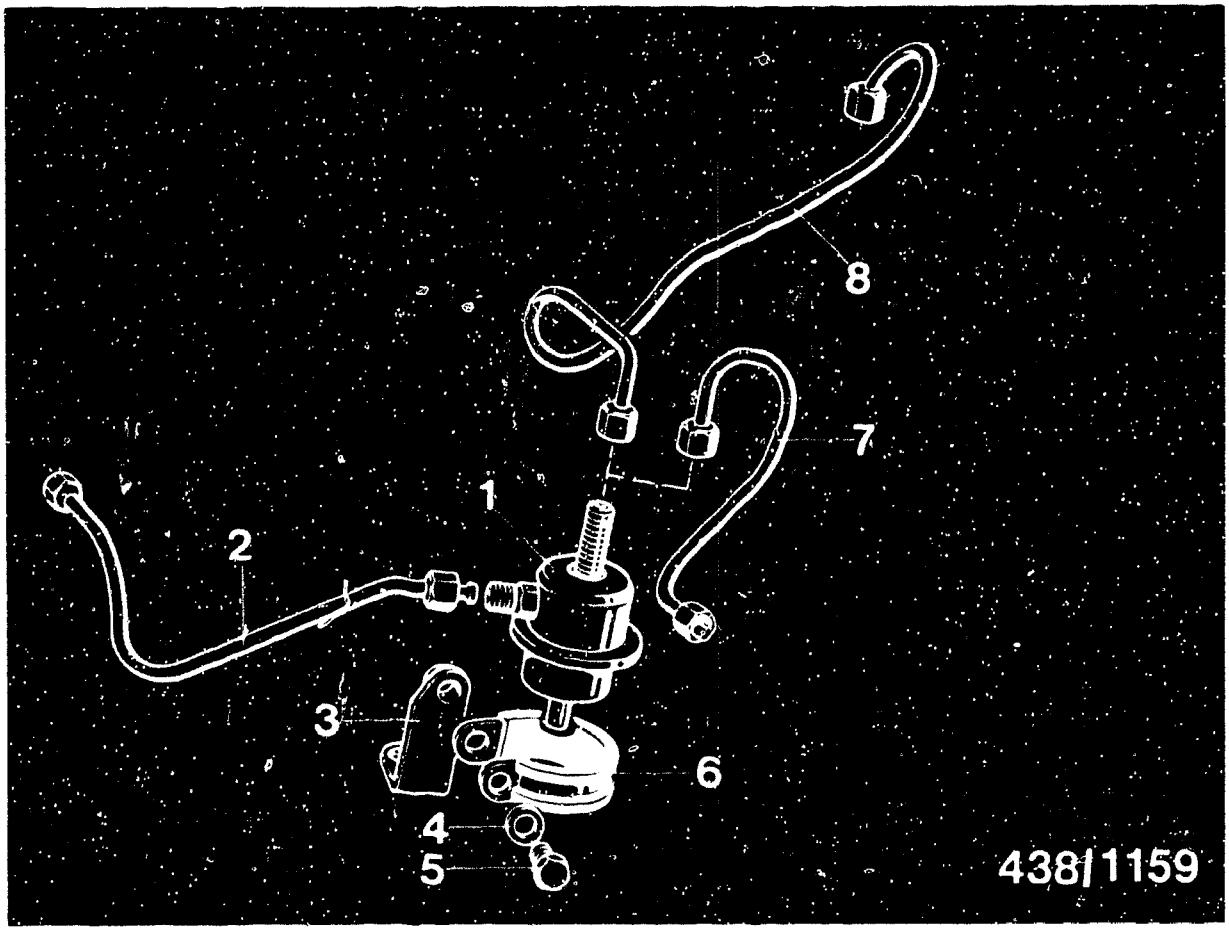
In addition to the Bosch fuel-line-pressure damper, various fasteners and connecting lines are required for installation. These should be obtained from your Porsche agent. The choice of the correct lines and the correct method of connection depend on whether the engine is equipped with the additional device for control-pressure reduction (control-pressure-reduction valve).



Parts required:

1 = Fuel-line pressure damper Bosch No. 0 280 161 007

2 =	Fuel line from fuel distributor to pressure damper	Porsche Part	928.110.505.01
3 =	Angle bracket	" "	928.110.231.02
4 =	Plain washer	" "	N 011.524.7
5 =	Screw M 6x12	" "	N 010.212.14
6 =	Fastening clamp	" "	999.110.525.00

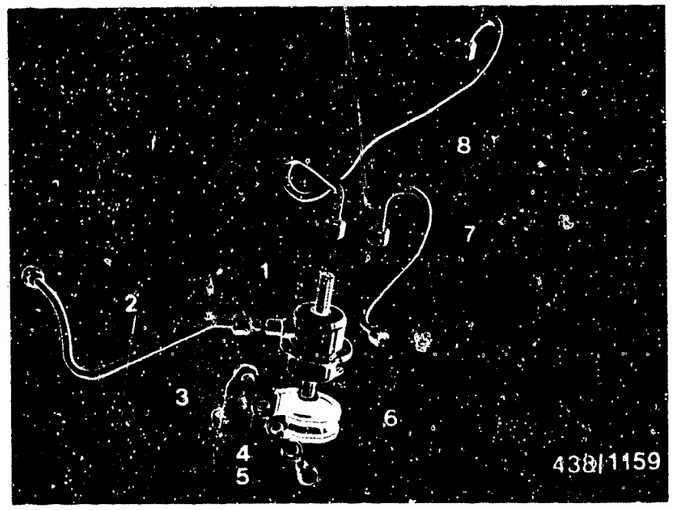


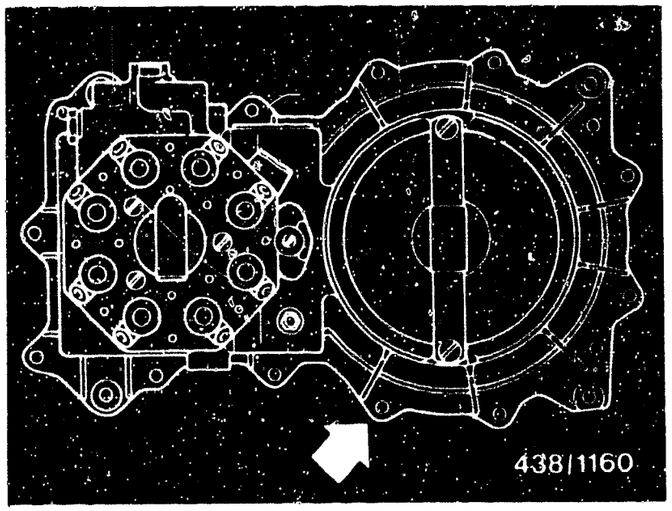
7 = Fuel line
from pressure damper
to control-pressure-
reduction valve — Porsche Part 928.110.503.00

8 = Fuel line
from pressure damper
to warm-up regulator,
for version without
control-pressure
reduction — " " 928.110.189.05

Installation:

- Remove cylinder 4 intake port.
- Remove fuel line (control-pressure line) from fuel distributor to warm-up regulator, or from fuel distributor to control-pressure-reduction valve (if fitted).
- Secure the angle bracket (Item 3) using the screw of the air-flow sensor mounting hole identified by an arrow in the picture.
- Mount pressure damper (Item 1) on angle bracket with fastening clamp (Item 6), screw (5) and washer (4). Initially, only finger-tighten screw.
- Install fuel line from fuel distributor to pressure damper (side connection).
- Install fuel line from pressure damper (upper connection) to warm-up regulator (Item 8), or from pressure damper to control-pressure-reduction valve (if fitted, Item 7).
  Tightening torque of union nuts: 20 Nm.
- Finally tighten fastening screw of fastening clamp.
- Re-install cylinder 4 intake port, possibly using a new flange seal. Tighten hose bands securely.





18.7 Final Operations:

Check the shaped seal rings of the injection valves for damage. Replace damaged rings (Porsche service part).

Screw in injection valves with the screw sleeve and finger-tighten by the fixed hexagonal section of the injection valves.

Connect injection lines to the injection valves and to the fuel distributor (with new seal rings).

Before mounting the air filter, check all connections for leaks with the engine running.
Then mount the air filter (2 fastening screws in air-filter housing, 1 clamping screw through hole in intake manifold).

Finally, carry out the idle adjustment according to the following coordinates.

19. Idle-speed adjustment

19.1 Test conditions:

Warm the engine for adjusting the idle speed (oil temperature approx. 80°C).

Important note:

If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.

The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.

In vehicles with an air-conditioner, this should be switched off to stabilize the engine speed during idle-speed adjustment.

Rotational-speed measurement with separate tester.

Remove air filter top part (4 clamping bands).

Remove right-hand air-intake hose so that the blow-off change-over valve (for auxiliary-air injection) is accessible.

Remove air hose from blow-off change-over valve and seal off tight with a suitable plug (arrow).

Remount filter top part and air-intake hose.

19.2 Test specifications and setting values for idle adjustment:

Idle speed:

Model:	
Europe 1978/1979:	700 ... 750 min^{-1}
Europe 1980:	700 ... 800 min^{-1}
USA/Japan 1978/1979:	750 ... 850 min^{-1}

CO concentration:

Model:	
Europe 1978/1979:	2.0 ... 3.0%
Europe 1980:	1.0 ... 2.0%
USA/Japan 1978/1979:	2.0 ... 4.0%

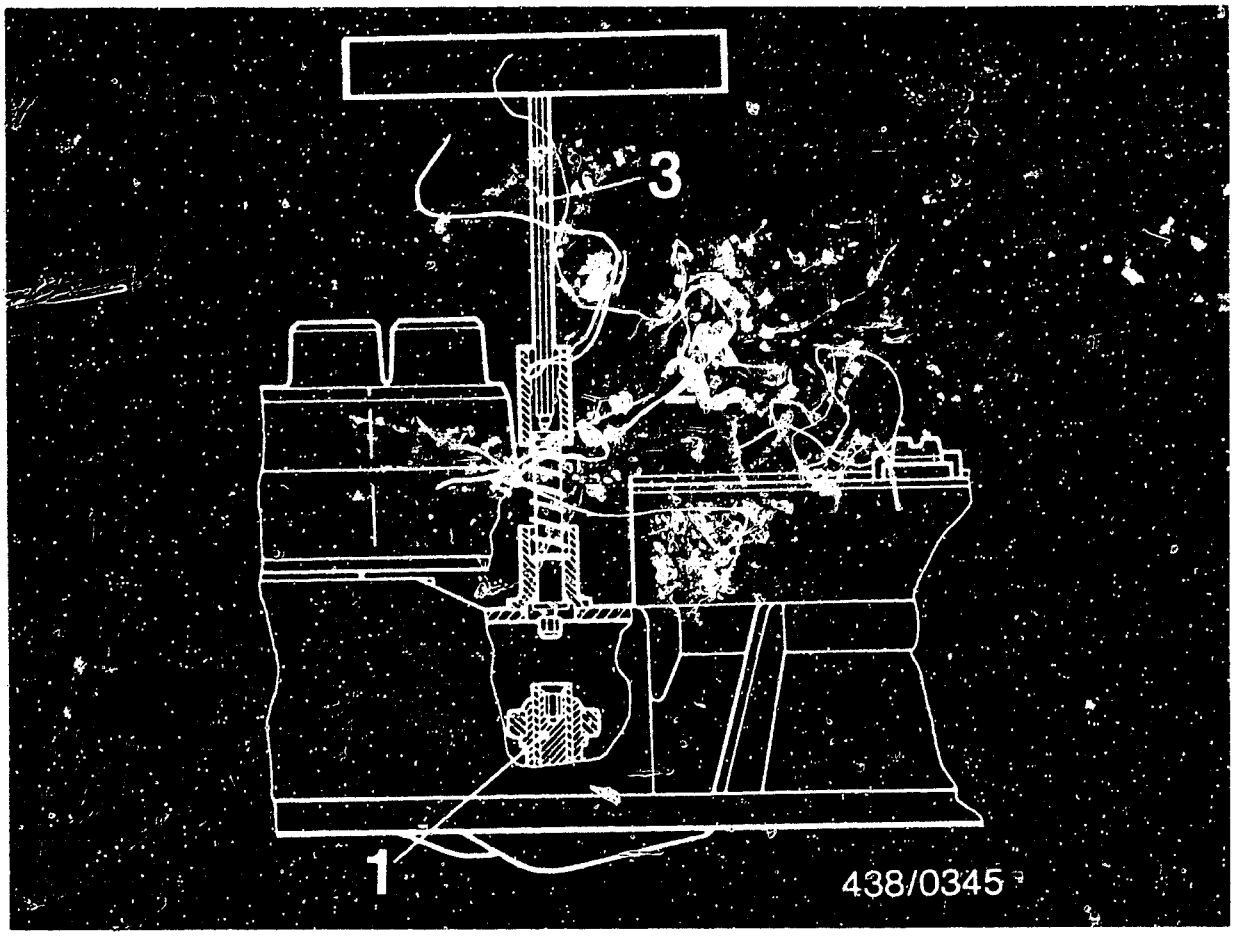
Auxiliary-air injection disconnected and line to engine sealed off tight.

19.3 Adjusting

Note: Perform the adjustment operations as quickly as possible so that the intake passages do not heat up.

Bring the engine to operating temperature (80° to 90°C oil temperature).

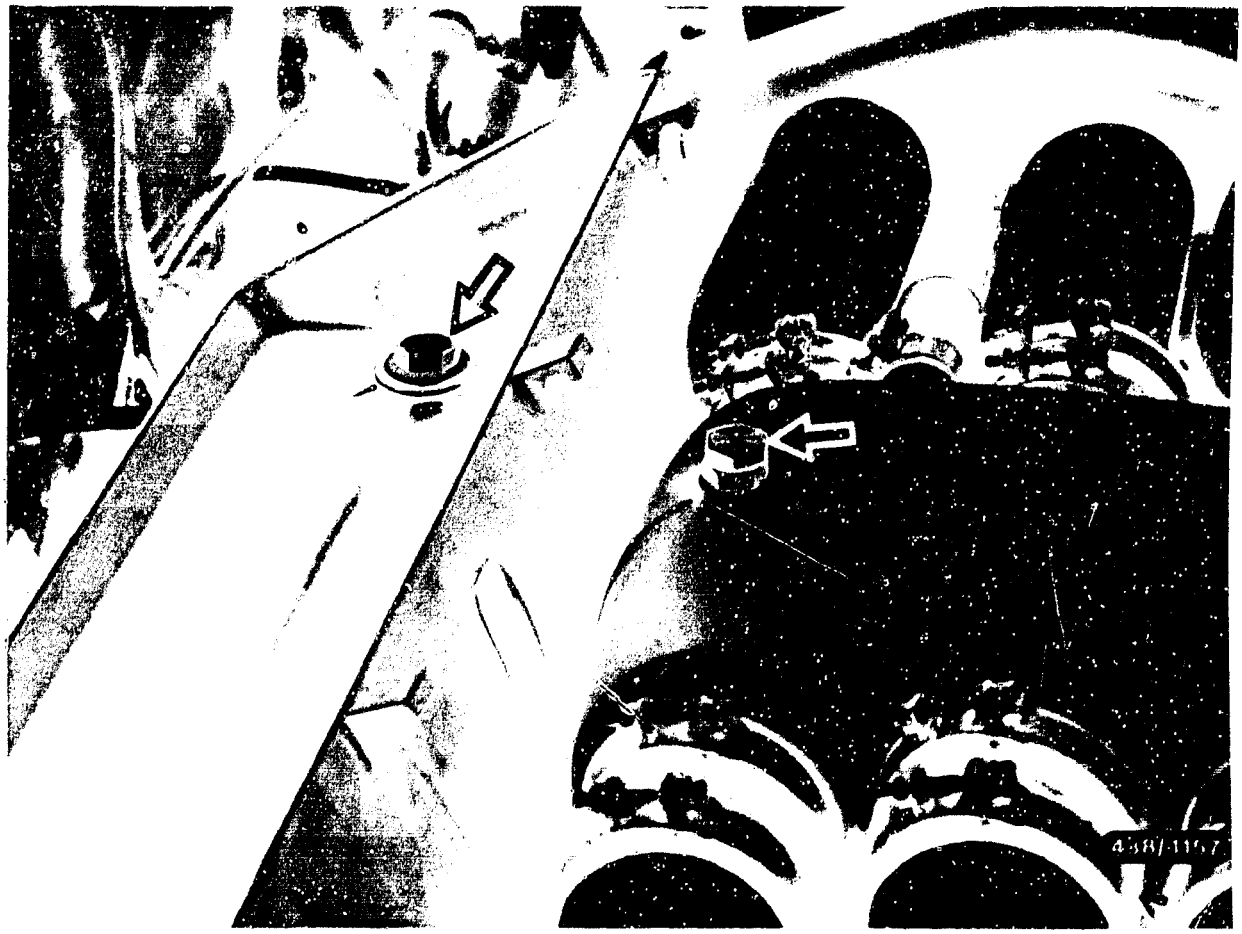
Adjust the idle speed at the adjusting screw on the throttle-valve assembly (arrow) at the front under the intake manifold.



1 = Idle-mixture-adjusting screw
2 = Spring-loaded setting device
3 = Adjusting wrench

The CO is adjusted by turning the idle-mixture-adjusting screw in the mixture-control unit by means of a spring-loaded setting device which is permanently installed on the air-flow sensor.

If a correction is necessary, the anti-tamper device in the opening to the setting device must be removed. To do this, it is necessary to remove the complete air filter.

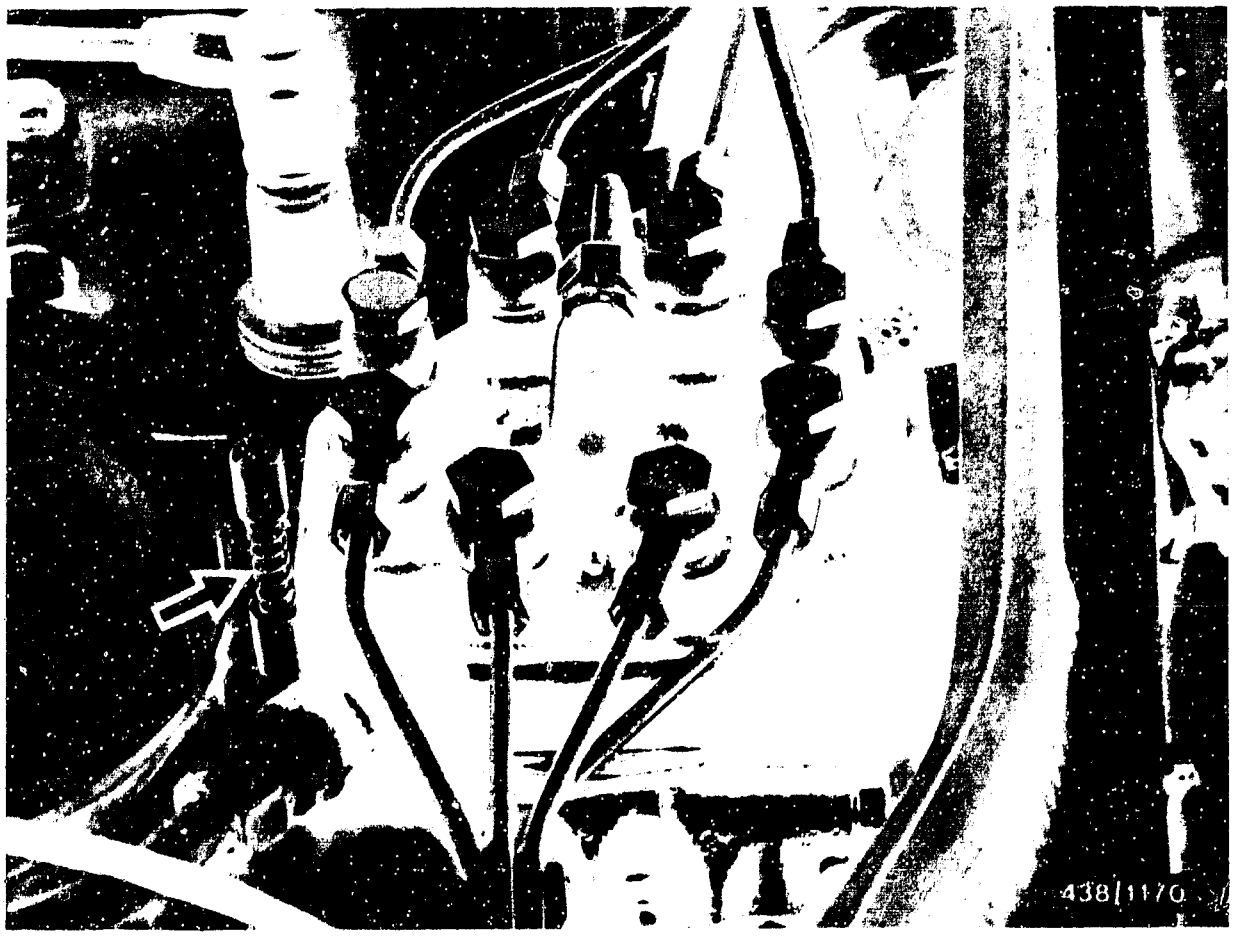


Removing the air filter:
Remove both intake-air hoses.

Remove air filter top part (unhook 4 clamping bands).

Unscrew the pressure screw in the intake manifold as well as the fastening screws in the air-filter housing (arrows), and withdraw the filter housing to the right. After removing the lead seal, remount the air filter for further adjustment.

Remove the anti-tamper device using a suitable tool, e.g. tool set no. 4521/7 from Firma Hazet, 5630 Remscheid.



The idle-mixture-adjusting screw in the mixture-control unit is actuated by means of the spring-loaded setting device (arrow).

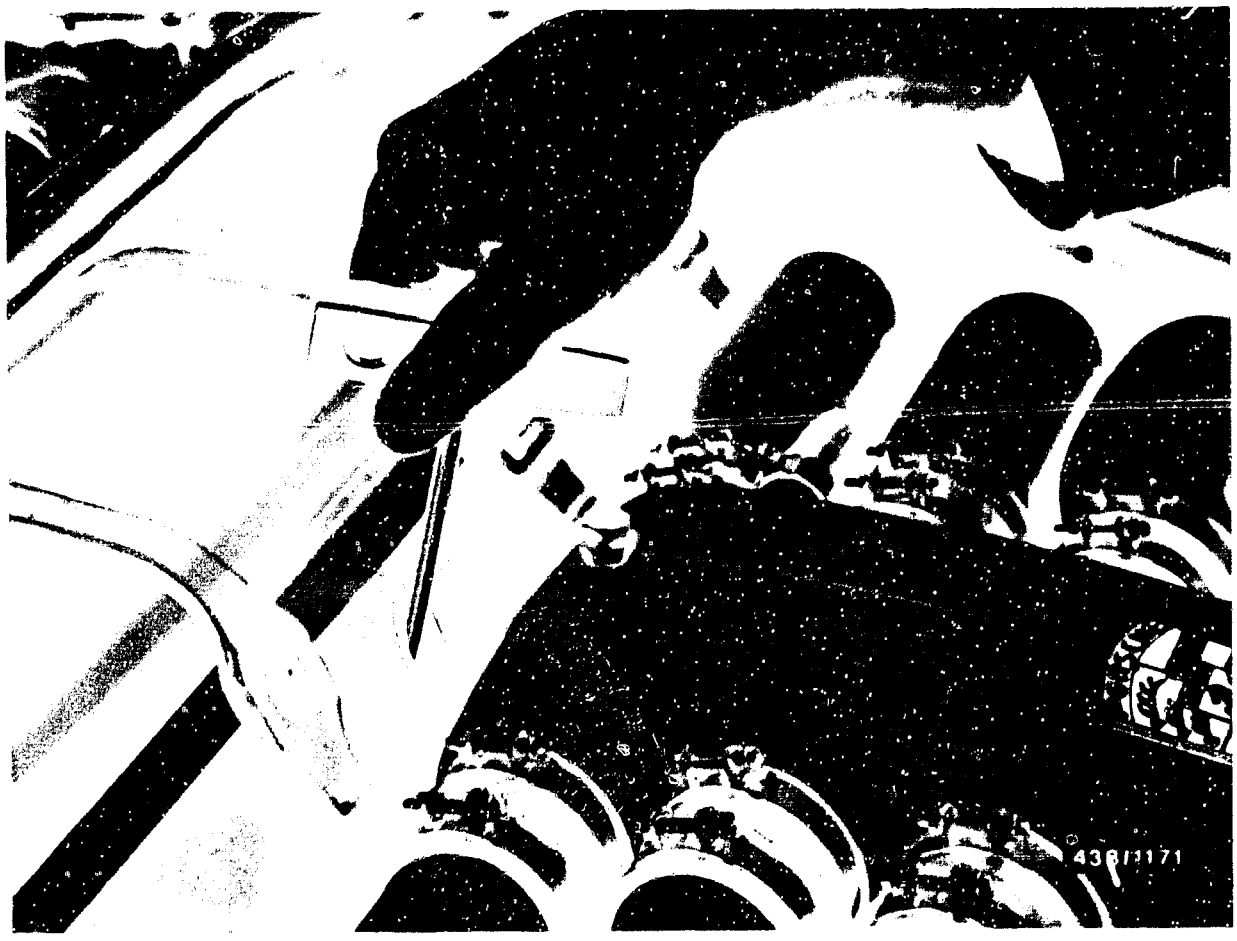
When the setting device is unloaded, the bore to the idle-mixture-adjusting screw is automatically sealed.

For adjusting the CO it is necessary to use a commercially available screwdriver for hexagon-socket-head cap screws with ball head AF 3.

Note: A suitable screwdriver is contained in Jetronic case KDJE-K 100.

Introduce the screwdriver through the funnel-shaped recess in the air filter into the setting device.

With the screwdriver, press the setting device approx. 18 mm downward until the setting device can be felt to engage the idle-mixture-adjusting screw. Adjust the CO concentration.



Turning in a clockwise direction: enriches the mixture
Turning in a counterclockwise direction: leans the mixture

Caution!

Always adjust from the lean side, i.e. if the setting is too rich, first of all turn the idle-mixture-adjusting screw more than necessary in a counterclockwise direction and then turn in a clockwise direction to the desired setting.

Note: Remove the screwdriver after each adjustment and briefly accelerate the engine so that the intake passages cool down. Wait briefly and then make the reading on the CO analyzer.
After performing the idle adjustment, remove the plug from the air hose of the blow-off change-over valve and connect the hose.

19.5 Anti-tamper device for idle-mixture screw:

In the Federal Republic of Germany, in accordance with an order for amending the Road Traffic Registration Code, § 47, Exhaust Gases and Their Discharge, has been amended. This order was printed in full in the Verkehrsblatt 13 of 15 July 1975.

Accordingly, all motor vehicles with externally suppliec ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.

These anti-tamper caps come in different colours. Use the following cap and colour for the after-sales service:
In the downdraft air-flow sensor:
Blue anti-tamper cap (not obtainable from Bosch).
Part No. of Daimler Benz 000.997. 5986
Of Deutsche Vergaser Gesellschaft: K 34 520

The housing bore (for receiving the adjusting wrench) is sealed by a plug.
The anti-tamper device is removed and fitted using special tools (e.g. tool set No. 4521/7 from Hazet Co. 5630 Remscheid).

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10.1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

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After-sales Service

Technical Bulletin

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Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor
Blue — securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520

updraft air-flow sensor
Red — Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

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Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
3.1983
(Replaces Ed. 5.1982)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
002	500	---	---
0 580 254 003	502	---	---
004	502	---	---
005	502	---	---
006	502	---	---
007	500	---	---
948	005	---	---
949	002	---	---
950	006	---	---
951	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
958	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
962	002	---	---
963	005	---	---

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Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 964	1 587 010 002	---	---
965	002	---	---
966	002	---	---
967	002	---	---
968	002	---	---
969	002	---	---
970	002	---	---
971	002	---	---
972	002	---	---
973	002	---	---
974	002	---	---
975	003 ④	---	---
976	004 ③	---	---
977	004 ③	---	---
978	1 587 410 901	---	---
979	010 004 ③	---	---
980	002	---	---
981	002	---	---
982 ①	003 ④	---	---
982 ②	1 587 410 901	---	---
984	010 004 ③	---	---
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996	---	386 011	001
998	---	385 004	002
9 580 234 003	002	---	---
005	002	---	---

1 = up to FD 822 2 = from FD 823

3 = Parts set ..003 also possible (delivery-line connection at 90°)

4 = Parts set ..004 also possible (delivery-line connection axial)

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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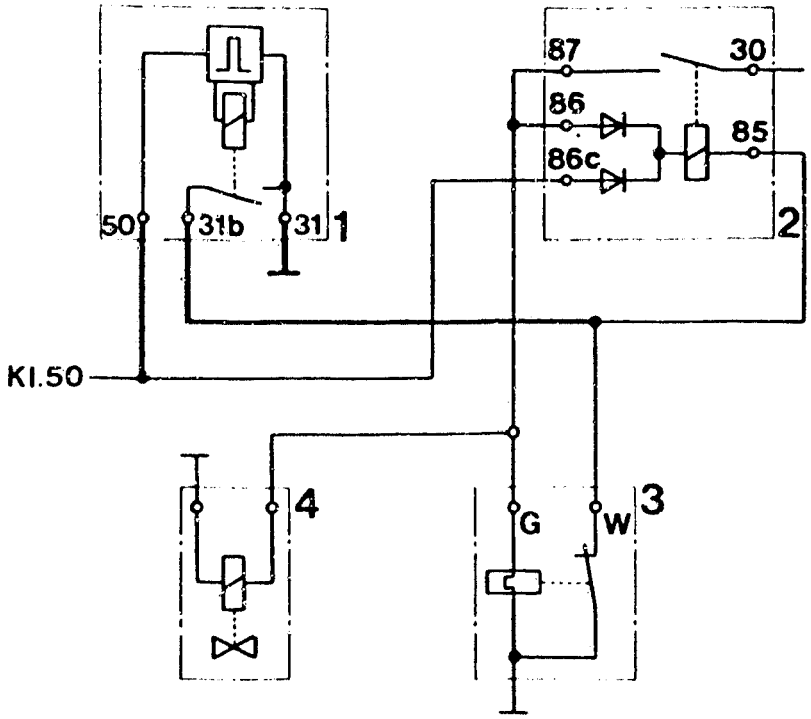
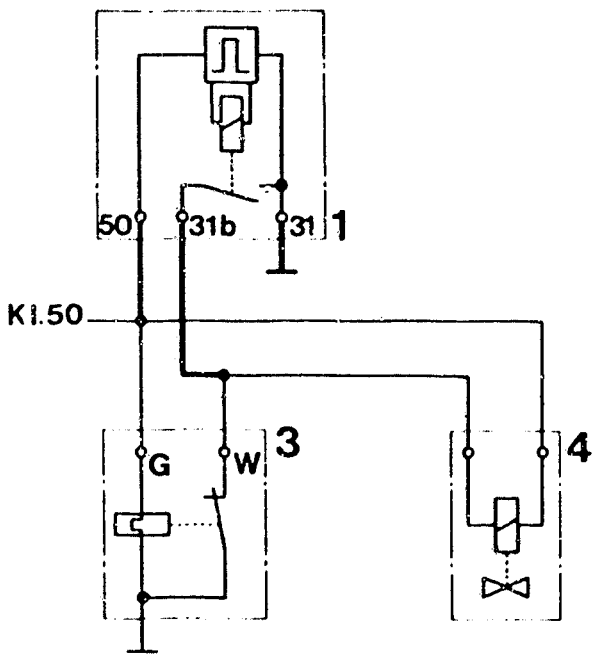


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

TUBE FITTING WITH FILTER IN WARM-UP REGULATOR 0 438 140 ...

VDT-I-438/106 En
4.1980

Warm-up regulator 0 438 140 065, used in MB 230 E, has a filter in the tube fitting for the fuel inlet to prevent dirt getting in.

When other warm-up regulators with the same connections give trouble or fail because of dirt getting in, then we recommend that you fit the new warm-up regulator with this tube fitting with filter, part no. 1 433 356 802.

During assembly a flat seal ring A 10 x 14 DIN 7603-C-CU, part no. 2 916 710 649, is laid underneath and the tube fitting is tightened with 20...22 Nm (2.0-2.2).

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After-sales Service

Technical Bulletin

FIRMLY FITTED NON-RETURN VALVE

VDT-I-438/107 En

Repairs
fuel pumps 0 580 254 ...

5.1980

Previously fuel pumps with non-exchangeable non-return valve (see VDT-I-438/104 En) had to be exchanged completely in cases of leakage in the non-return valve.

If the fuel pump is in working order and only the non-return valve leaks, there is now the possibility of repairs as part of after-sales service. 2 parts sets have been produced for this purpose, they contain, amongst other things, a tube fitting with built-in non-return valve.

Before using the parts set the installation conditions should be checked. The defective non-return valve can remain in the fuel pump which does not have to be dismantled for fitting the parts set. Before disconnecting the fuel lines the pressure fittings of the fuel pump and the fuel lines should be thoroughly cleaned.

Description and fitting

Parts set 1 587 010 003 for fuel connection with inlet union.

Screw the tube fitting (short side) with the thick flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Place the thin flat seal ring, the fuel-line inlet union and the other flat seal ring on to the long side of the tube fitting and tighten with the hexagon cap nut. Run the engine and check that there are no leaks in the connection.

Parts set 1 587 010 004 for fuel connection with nipple and union nut.

Screw the tube fitting with flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Screw the fuel line to the tube fitting with a union nut and tighten. Run the engine and check that there are no leaks in the connection.

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After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

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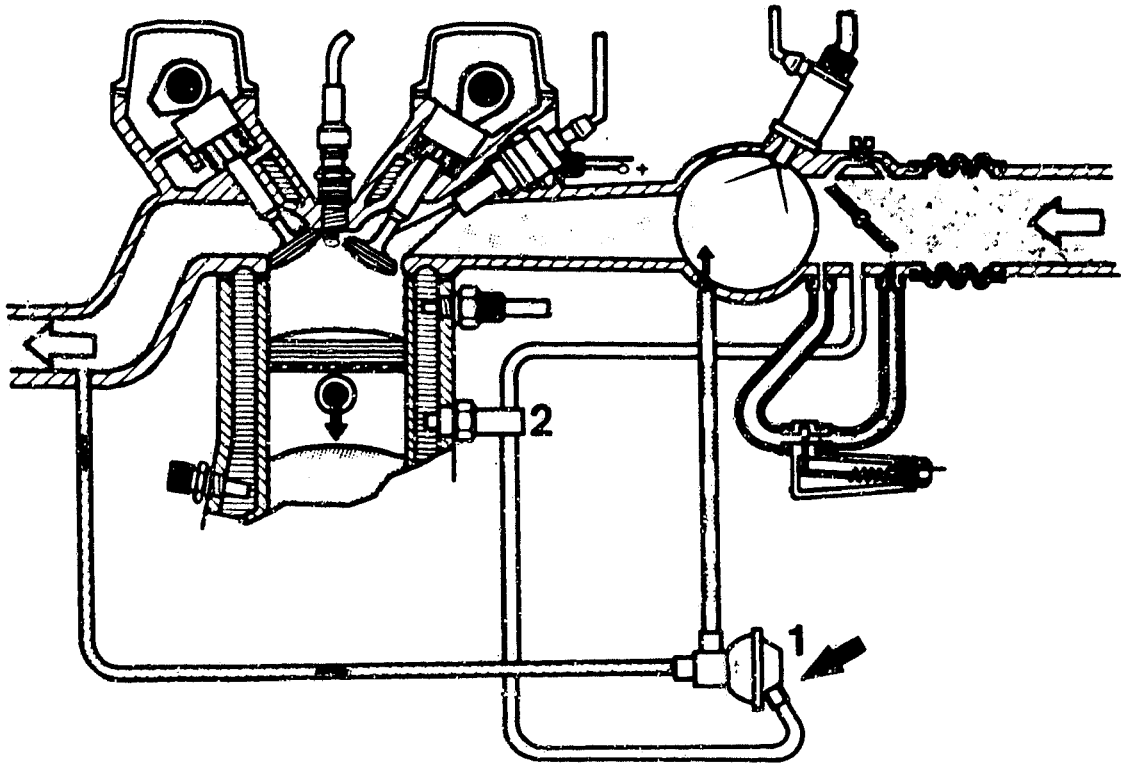
1. Exhaust-gas recirculation (EGR)



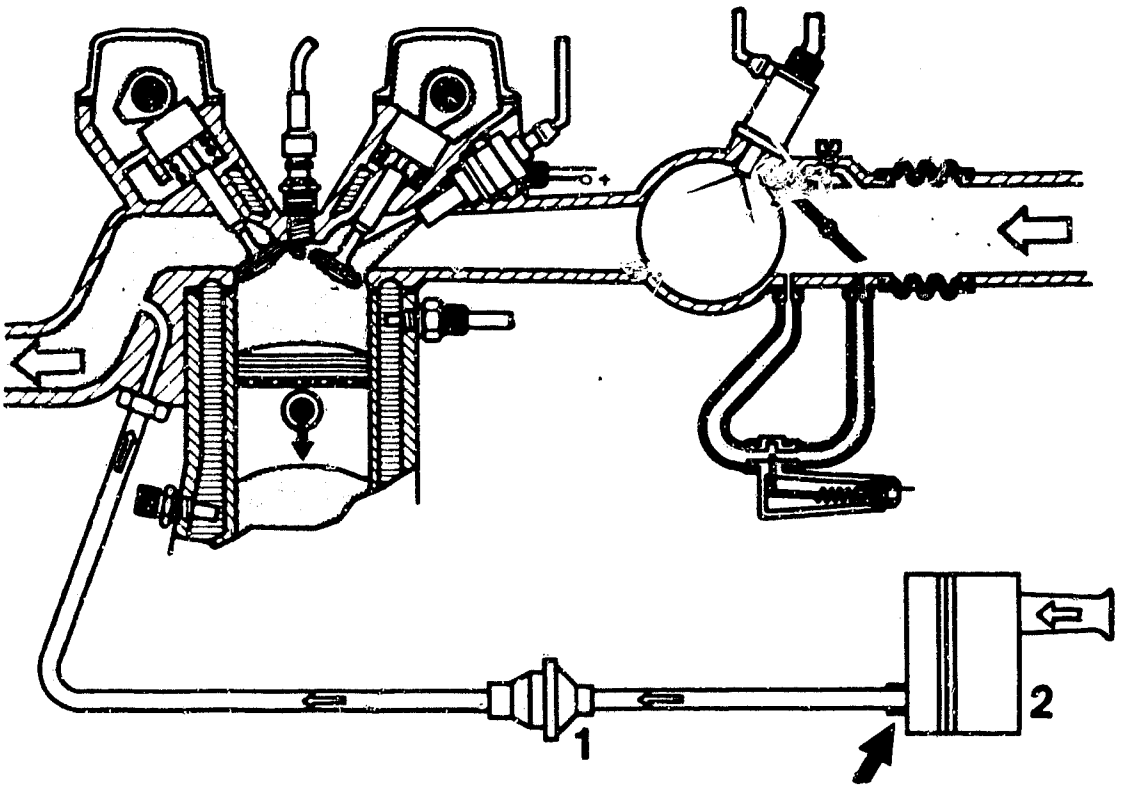
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



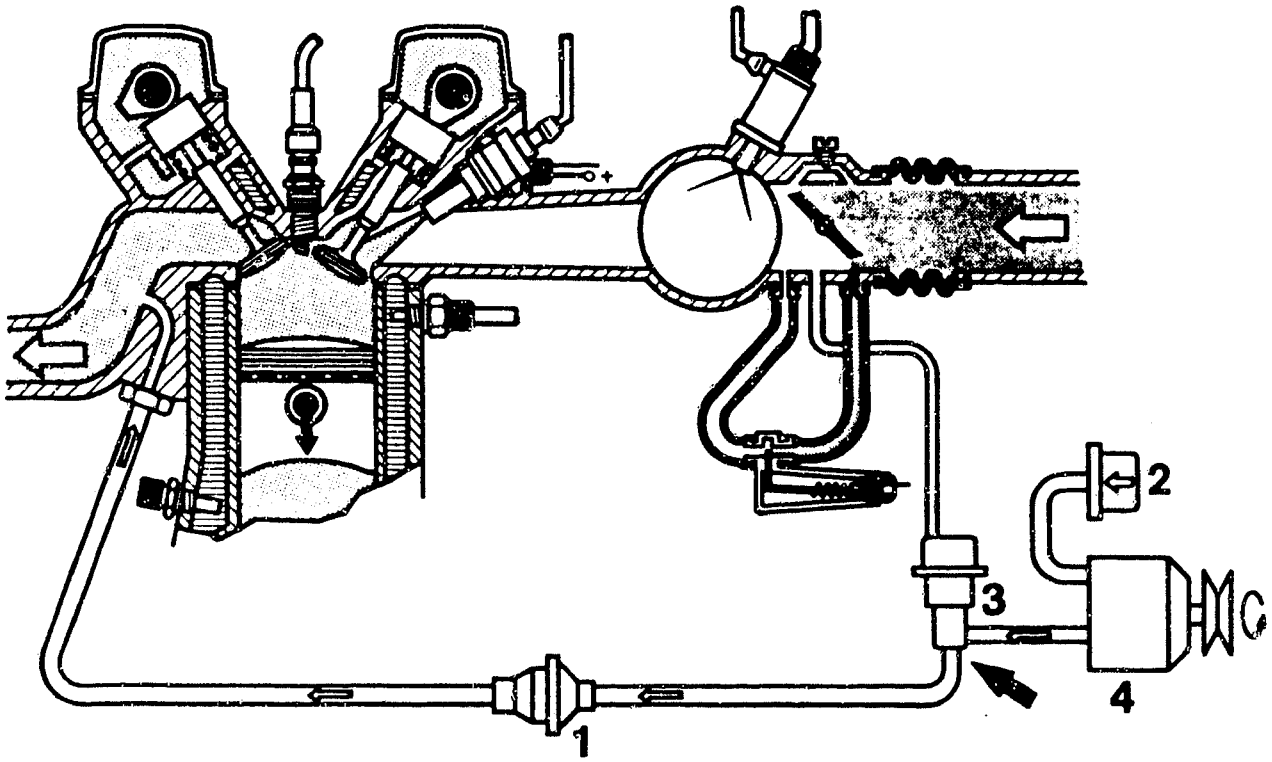
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



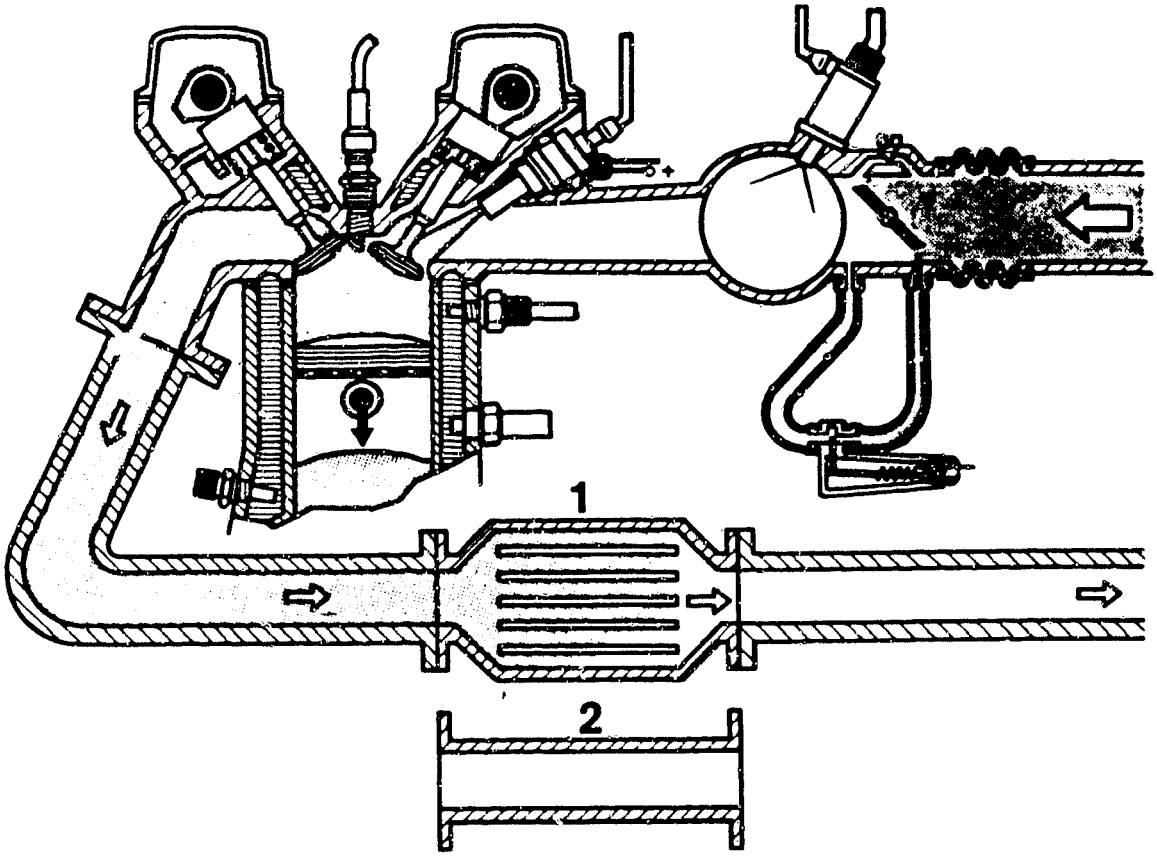
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.
Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

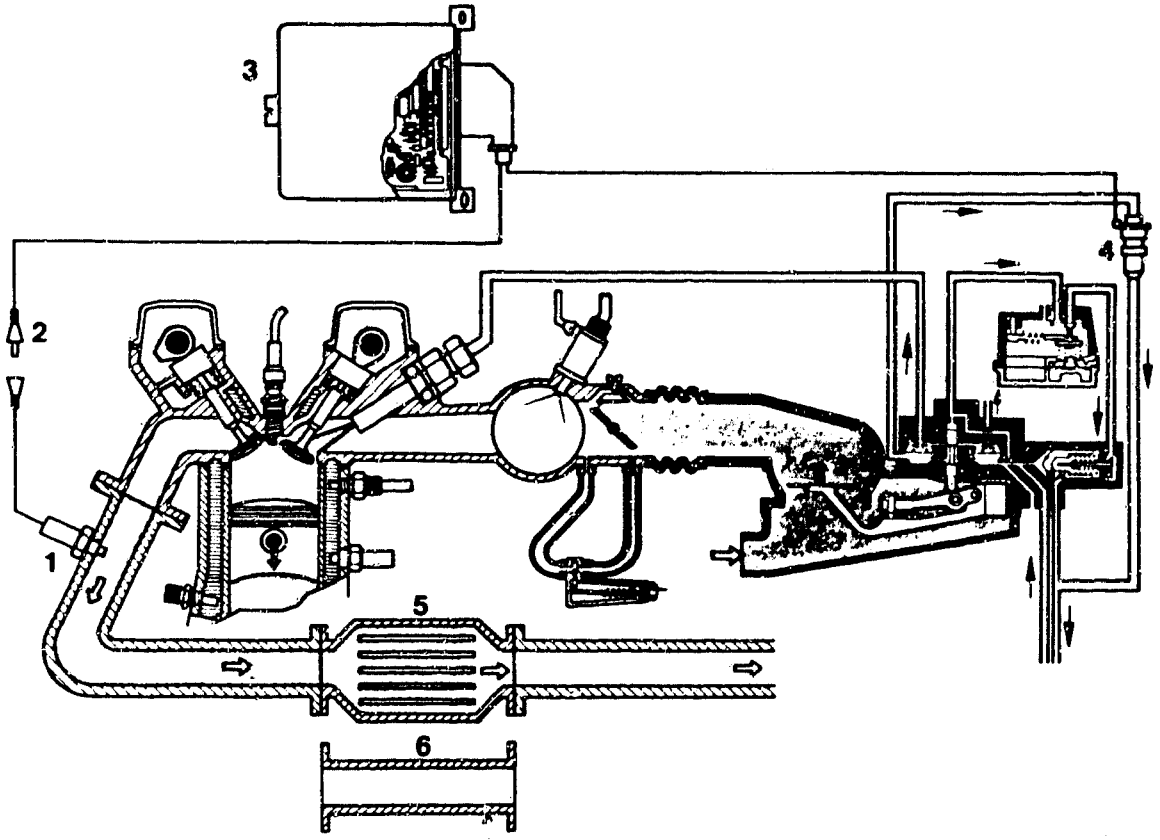
When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.

5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

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After-sales Service

Motor Vehicle Service Information

PORSCHE 928, 928 S
K-Jetronic

VDT-I-POR 019 En
12.1981

Auxiliary device for control-pressure reduction when hot-starting.
New version of fuel distributor and additional pressure damper.
New versions of warm-up regulator.
After-sales service instructions.

1. Auxiliary device for control-pressure reduction when hot-starting:

To improve the hot-starting performance, the Porsche 928 and 928 S models have been equipped since 18 February 1981 with an auxiliary device for control-pressure reduction when hot-starting.

The auxiliary device is not made by Bosch and comprises a solenoid-operated needle valve with mounting piece and corresponding connection lines. The valve is mounted on the flange of the intake tube of cylinder 3 and is hydraulically connected in parallel with the warm-up regulator. The valve is electrically energized via terminal 50 and a thermo-switch.

Operation:

When the engine is started at normal operating temperature, the control pressure of the K-Jetronic is near the shutoff point of approx. 3.6 bar gauge pressure on account of the contact heat of the warm-up regulator.

Since, after switching off the engine at normal operating temperature, it is possible for vapor bubbles to form in the fuel-injection lines, advantages can be gained from reducing the control pressure when hot-starting. The thus increased fuel delivery accelerates the process of driving the vapor bubbles out of the injection lines and therefore improves the starting ability of the engine. This reduction in control pressure is brought about by the above-mentioned control-pressure-reduction valve.

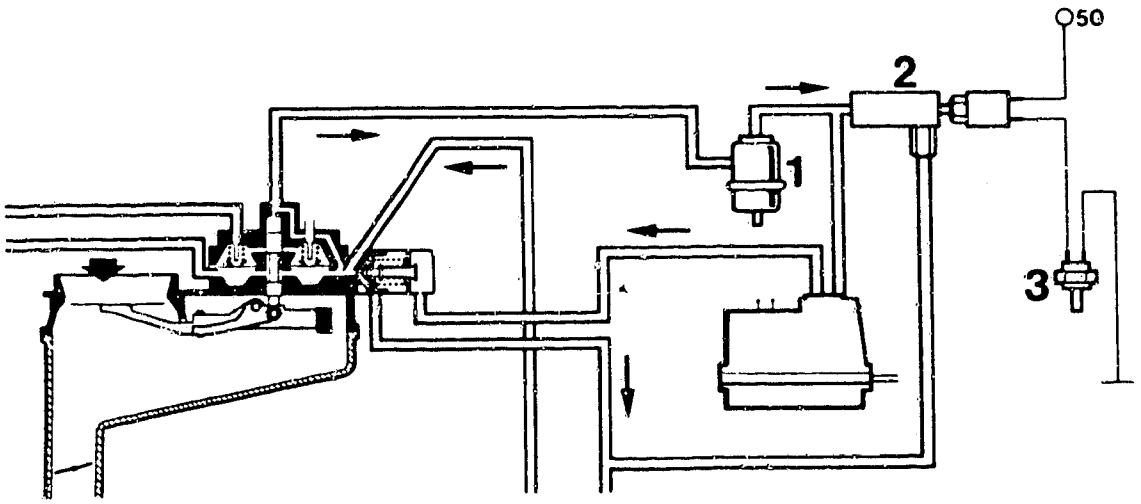

Fig. 1 1 = Fuel-line-pressure damper (see Section 2)
2 = Control-pressure-reduction valve
3 = Thermo-switch

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When open, the valve establishes a direct connection between the fuel distributor and the fuel-return line in the control-pressure circuit. This interrupts the operation of the warm-up regulator and the control pressure is reduced to approx. 0.6 bar gauge pressure.

The thermo-switch provides the ground connection to the solenoid-operated valve, and operating the starting motor provides the positive connection from terminal 50. Consequently, the control-pressure reduction is only effective at temperatures above 35°C and only when the starting motor is operated.

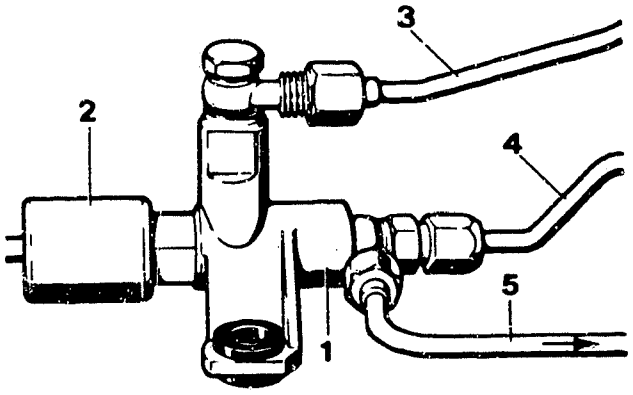

Fig. 2

1 = Control-pressure-reduction valve
2 = Solenoid
3 = Fuel line to fuel return line
4 = Fuel line from fuel distributor
5 = Fuel line to warm-up regulator

Important note:

The effect of a possible fault in the control-pressure reduction system should be borne in mind when trouble-shooting in the vehicle (control-pressure testing, leak test on the overall system).

2. Fuel distributor with capsule valve and additional pressure damper:

As from the 1981 model year the Porsche 928 and 928 S models are equipped with a fuel distributor with a capsule valve (instead of non-adjustable flow control valve).

Operation:

The capsule valve contains a spring-loaded valve piston with restriction bore. The restriction bore has the same job as the previous non-adjustable flow control valve, namely that of damping the vibrations of the air-flow sensor plate as a result of pulsations in the air flow.
The enrichment of the air-fuel mixture necessary for acceleration is determined by the overshoot of the air-flow sensor plate and the resulting rise of the control plunger. The degree of overshoot is determined by the size of the restriction above the control plunger. In the case of rapid acceleration the valve piston in the capsule valve is lifted, thus resulting in a faster displacement of the fuel over the control plunger. This optimizes the transition response of the engine. The valve piston remains closed under slow acceleration and in all other engine operating conditions.

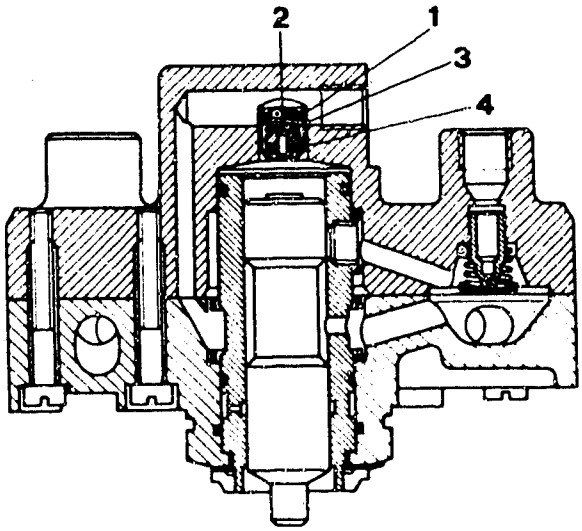

Fig. 3

1 = Capsule valve
2 = Restriction bore
3 = Valve spring
4 = Valve piston with seal ring

This modification of the fuel distributor was made without changing the part number. However, the different versions are identified by the color of the nameplate:

Fuel distributor part number: 0 438 100 027

Color of nameplate:

Fuel distributor with non-adjustable flow control valve, earlier version:	red
Fuel distributor with capsule valve, as from 1981 model:	black/red

The introduction of the fuel distributor with capsule valve also requires the installation of a fuel-line-pressure damper in the control-pressure line from the fuel distributor to the warm-up regulator.

In one of its Service Information Sheets, Porsche has informed its own after-sales service organization about the above-mentioned modifications and additions and has directed that, after stocks have been used up, exclusive use is to be made of the 1981 model fuel distributor (with capsule valve) even when replacing the fuel distributor in earlier models (1978 to 1980).

We have decided that this policy will also be adopted by the Bosch After-Sales Service Organization.

However, when converting to the new fuel distributor, it must be ensured that the fuel-line pressure damper is additionally installed.

Installation of the fuel-line pressure damper:
In addition to the Bosch pressure damper, various fasteners and connection lines are required for installation. These can be obtained from the Porsche agent. The choice of correct lines and the correct manner of connection depends on whether the engine is equipped with the auxiliary device for control-pressure reduction (see Section 1).

Parts required: (see Fig. 4)

1 = Fuel-line pressure damper	Bosch Part No.:	0 280 161 007
2 = Fuel line from fuel distributor to fuel-line-pressure damper	Porsche Part No.:	928.110.505.01
3 = Bracket	" " "	928.110.231.02
4 = Plain washer	" " "	N 011.524.7
5 = Bolt M 6x12	" " "	N 010.212.14
6 = Fastening clamp	" " "	999.110.525.00
7 = Fuel line from fuel-line-pressure damper to control-pressure-reduction valve	" " "	928.110.503.00
8 = Fuel line from fuel-line-pressure damper to warm-up regulator, for version without control-pressure reduction	" " "	928.110.189.05

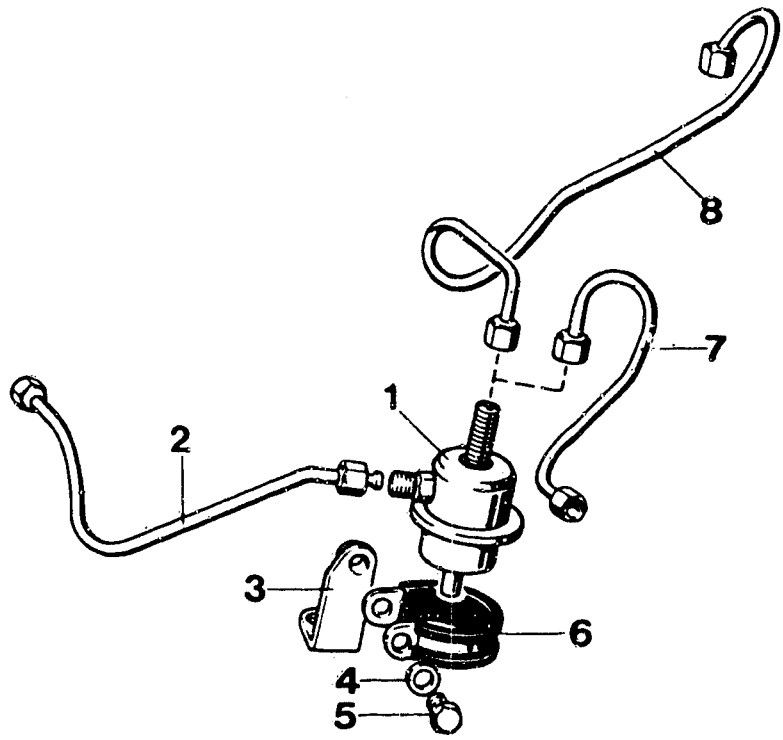

Fig. 4 Parts required with pressure damper

Installation:

- Remove the intake tube of cylinder 4.
- Remove the fuel line (control-pressure line) from the fuel distributor to the warm-up regulator, or from the fuel distributor to the control-pressure-reduction valve (if fitted).
- Secure the bracket (Item 3) with the bolt of the air-flow sensor mounting hole shown by an arrow in Fig. 5.
- Fasten the fuel-line-pressure damper (Item 1) to the bracket with the fastening clamp (Item 6), bolt (5) and washer (4). For the time being, only tighten the bolt finger-tight.
- Install the fuel line from the fuel distributor to the fuel-line-pressure damper (side connection).
- Install the fuel line from the fuel-line-pressure damper (top connection) to the warm-up regulator (Item 8) or from the fuel-line-pressure damper to the control-pressure-reduction valve (if fitted, Item 7). Tightening torque for the union nuts: 20 Nm.
- Finally tighten the fastening bolt of the fastening clamp.
- Re-install the intake tube of cylinder 4. If necessary, use a new flange seal. Tighten the hose clamps securely.

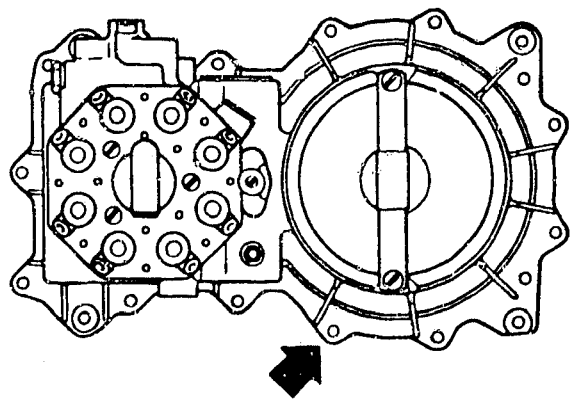

Fig. 5

3. New versions of warm-up regulator:

To improve the warm-running performance of the 928/928 S models, warm-up regulators with a modified characteristic have been installed as of the 1981 model year:

Warm-up regulator part numbers:

928: 0 438 140 087
928 S: 0 438 140 086

These warm-up regulators are provided with two separate heating resistors, one of which is triggered by a thermo-contact.

Operation:

At temperatures below 15°C the thermo-contact is open. After the engine has been started in this temperature range, therefore, there is initially only one heating resistor switched on, as a result of which the shutoff of the warm-up regulator is delayed.

When a temperature of 15°C is exceeded, either as a result of high ambient temperature or due to the heating resistor already switched on, the thermo-contact closes and switches on the second heating resistor. Both heating resistors are connected in parallel. Therefore, at temperatures above 15°C the thus increased heating effect accelerates the shutoff of the warm-up regulator.

Porsche has advised its own after-sales organization to install only the above-mentioned 1981 warm-up regulators even in older vehicles (1978...1980 models), should a replacement be necessary.

We have decided that this policy will also be adopted by the Bosch After-Sales Service Organization.

In this connection, pay close attention to the following point:

In the case of warm-up regulators with a thermo-contact it is absolutely essential to ensure the correct polarity of the electric connector. Incorrect connection will cause irreparable damage to the thermo-contact.

On the 928/928 S vehicles of model years 1978 to 1980 the correct polarity is not specified. Therefore, this must be tested when installing the new warm-up regulators and must, if necessary, be corrected on the connector (+ to +, - to -).

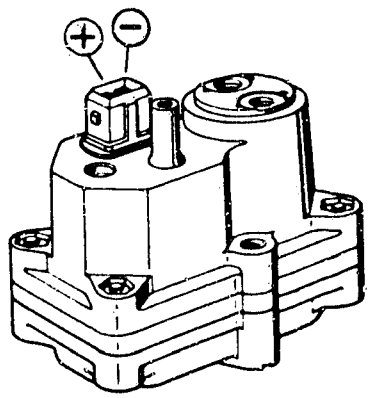

Fig. 6

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